EXHIBIT H

00001

VOLUME I

IN THE UNITED STATES DISTRICT COURT

FOR THE EASTERN DISTRICT OF PENNSYLVANIA

AGERE SYSTEMS, INC., CYTEC INDUSTRIES, INC., FORD MOTOR COMPANY, SPS TECHNOLOGIES LLC and TI GROUP AUTOMOTIVE SYSTEMS LLC

Plaintiffs

V CIVIL ACTION NO.02-CV-3830 (LDD)

ADVANCED ENVIRONMENTAL TECHNOLOGY CORPORATION, ET AL.

Defendants

Oral deposition of JAY VANDEVEN, taken at the law offices of Ballard Spahr, Andrews & Ingersoll, LLP, 1735 Market Street, 42nd Floor, Philadelphia, Pennsylvania, on Tuesday, February 13, 2007, at a.m. before Jennifer Bermudez, a Registered Professional Reporter, and Notary Public, pursuant to notice.

00479

A. In the ranking process?

Q. In the ranking process, generally.

A. At this time, which was still prior to the 1990 NCP, the 1985 NCP and the HRS at the time considered essentially three -- or four elements; contamination of groundwater, contamination of soil, air contamination and risk of fire and explosion.

So particularly prior to 1990 if there was contamination of groundwater that was currently being used, that is currently a potable drinking water system that was contaminated, that was enough to get you above a 28 and a half on the HRS.

If you had a site that contained drums, that was enough to instigate a removal action at a Superfund site. So those are some of the factors that were used regarding the listing of the Boarhead Farms

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they calculated it, but I have no reason sitting here today to question their calculated recharge rate.

Q. And you did not make a calculation yourself in preparing your report as to the recharge rate and how much water would have infiltrated the Boarhead site in any particular area of the Boarhead site?

A. That's correct.

Q. Am I right you could also use the groundwater modeling report to measure the flow of water, the groundwater flow of water -- the groundwater flow at the site?

MR. HARRIS: Objection.

THE WITNESS: You are going to have to rephrase that. I'm not sure I understand.

BY MR. PETTIT:

Q. Okay. Am I correct that the groundwater modeling report gives you data that would enable you to evaluate the volume of water that was

00269
flowing through the groundwater system at Boarhead?

A. I believe that that was one of the outputs from their groundwater model, the transmissivity, or the volume of groundwater, as you put it, that flowed through a certain area of the site, yes.

Q. And in preparing your report, did you make any calculations using that data of the flow of groundwater?

A. No, I did not.

Q. And just going back to Page 6 of the second bullet, the last bullet on Page 6 of your rebuttal, you talk about large quantities of liquids would cause increase in migration metals in the subsurface.

This would tend to reduce the concentration of hazardous substances and spread them over a larger area.

Would that include

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contributed to the need for and the cost of remediation.

Whereas, the other expert reports that this statement is related to seem to be making very general statements and then saying, therefore, this waste or this chemical did not contribute to the need for remediation at the site.

Q. Do you believe that the general statements in your original report account for site-specific conditions?

A. To the extent that they needed to to support my opinion, yes.

Q. And for example, could you give me an example of what you refer to as a site-specific condition?

A. A site-specific condition is, for instance, the fact that there is a diabase there that has relatively high concentrations of natural metals and that acid wastes that come in contact with that

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diabase could dissolve those metals, it could enhance the migration of those metals down gradient.

That's one of the reasons they had to treat metals in the residential water systems -- water treatment systems that they installed.

So that would be a site-specific consideration, the fact that there was a diabase there that had high concentration of metals.

Q. Would the groundwater monitoring wells, the results of that over time, would that give you data on site-specific conditions at the site?

A. Well, sure it will give you information on the concentrations of contaminants that were found at the site.

Q. And how about the recharge rate that was calculated in the remodeling report, would that give

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degradation that you could get of organic compounds like TCE would have been reduced.

Again, the second sentence there, the last sentence in that paragraph, again it would depend on when they say the effects of acid disposal, it would really -- in general that statement may be correct, but it would depend on the volume of the acid spill, the type of acid, how strong that acid was.

So there would be a lot of other factors that you would have to look at for an individual acid spill or acid disposal.

Q. Now, in connection with the preparation of your report, did you review any information that was specific for those factors with respect to the Boarhead site?

A. I don't believe so, no.

Q. With respect to the destruction of microorganisms being

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Q. Well, does the fact that, as stated in the RI, that drums were removed from areas that are down gradient of some of the likely bulk disposal locations mean that materials disposed in the bulk disposal locations actually migrated to become located later in the area that became the drum disposal area?

A. I didn't follow that.

Q. Well, the first sentence of this bullet, which you have identified as being based upon the RI, states that drums were removed from areas that are down gradient of likely bulk disposal locations.

If we accept that as a fact, that fact does not necessarily mean, does it, that materials disposed in the bulk disposal locations migrated to reach the drum disposal area?

Put another way, the drum disposal area might have been down

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gradient of the likely bulk disposal locations, but that doesn't necessarily mean that the bulk materials disposed up gradient reached the drum disposal area, does it?

A. Right. It doesn't necessarily mean that, no.

Q. And you didn't do any independent calculation to try to determine that, did you?

A. No.

Q. At the bottom of Page 6 of Vandeven-5 there's a bulleted paragraph which reads, "Even if their pH was nearly neutral, releases of large quantities of liquids would cause increased migration of materials into the subsurface.

This would tend to reduce the concentrations of hazardous substances and spread them over a larger area.

Unless the concentrations

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waste came in contact with drums.

Q. Do you have any evidence that occurred at this site?

A. I don't recall seeing anything specific like that, but, again, there was very little on how he actually operated the site.

Q. And you also stated that another way that the kind of wastes I was talking about could contribute to the excavation and off-site disposal of buried drums was by mobilizing metals and the substances in these drums. Correct?

A. Correct.

Q. Again, would that be true if the disposal site of the waste was downhill from where the drums were buried?

A. Again, it's possible, if it migrated in the subsurface to the location of the buried drums.

Q. And again, and you were not asked to give an opinion on that, am

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contributed to the need for and the cost of remediation.

Whereas, the other expert reports that this statement is related to seem to be making very general statements and then saying, therefore, this waste or this chemical did not contribute to the need for remediation at the site.

Q. Do you believe that the general statements in your original report account for site-specific conditions?

A. To the extent that they needed to to support my opinion, yes.

Q. And for example, could you give me an example of what you refer to as a site-specific condition?

A. A site-specific condition is, for instance, the fact that there is a diabase there that has relatively high concentrations of natural metals and that acid wastes that come in contact with that

00276
diabase could dissolve those metals, it could enhance the migration of those metals down gradient.

That's one of the reasons they had to treat metals in the residential water systems -- water treatment systems that they installed.

So that would be a site-specific consideration, the fact that there was a diabase there that had high concentration of metals.

Q. Would the groundwater monitoring wells, the results of that over time, would that give you data on site-specific conditions at the site?

A. Well, sure it will give you information on the concentrations of contaminants that were found at the site.

Q. And how about the recharge rate that was calculated in the remodeling report, would that give

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For instance, trichloroethylene could degrade to dichloroethylene, vinyl chloride and then carbon dioxide.

If you release corrosive materials in the subsurface, the microorganisms that facilitate that degradation aren't going to survive, just like if somebody dumped a vat of sulfuric acid on you, you are not going to survive.

It kills living organisms.

And so those living organisms aren't around to degrade the trichloroethylene and therefore the trichloroethylene can be a lot more persistent.

Q. The next sentence reads, "Such solutions may have also mobilized metals that were naturally present in the soils at the site." Is that an opinion you hold to a reasonable degree of scientific certainty?

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A. Yes.
Q. And why do you use the term "may" there? Is that the equivalent of reasonable degree of scientific certainty?
A. I guess, again, the only reason I use "may" there is there was no specific test that was done at the site to determine that that's how, for instance, the high levels of metals were found in the residential wells that they were dissolved from the diabase material because of the corrosive wastes.
There was no specific evaluation or testing done to determine that that was the phenomenon that caused that.
Q. What data is there at the site that relates to that question?
A. Well, there's data relating to the fact that you did have corrosive materials disposed of at the site, there's data related to the

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fact that you have high levels of metals throughout the site both in soils and in groundwater and in residential wells off site, and there's data at the site indicating that there is a geologic formulation, namely this diabase that has high concentrations of metals.

Q. Is there any other data that you are aware of that's at the site that relates to that opinion?

A. No.

Q. And did you consider all that data in coming up with this opinion?

A. Yes, I did.

Q. Now, is there any data at the site that indicates that there's a degradation of organic carbon as a result of discharge of corrosive solutions without substantial quantities of metal?

A. Any specific data to show that?

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Objection to the form of the question. Vague. Ambiguous.

THE WITNESS: I don't recall any other assumptions that I had to make to reach my opinions.

BY MS. FLAX:

Q. Mr. Vandeven, you are not offering an expert opinion with respect to allocation. Is that correct?

A. That's correct.

Q. And you are not offering an opinion as to the causes and timing of environmental property damage. Is that correct?

A. Well, I would -- well, I'm not sure I would say that. I would say that my opinion would generally come under the category of causes of property damage at the Boarhead Farms site.

The causes of property damage at the Boarhead Farms site are in totality all of the wastes that

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talked about in the last couple of days?
A. Correct.
Q. Can you quantify in any way the part of the cost of the remedies that we were talking about a little bit earlier that the pickle liquors generally, pickle liquors have played in that and at what fraction of the costs?
A. No. I was not asked nor did I develop any cost allocation for this case.
Q. Do you believe that the pickle liquors were one of the elements that drove the remedy?
A. I believe that pickle liquor waste if disposed of at the site contributed to the need for the remedy and the cost of the response actions, yes.
Q. But you can't quantify that in any way, whether it is one percent or 99 percent?

EXHIBIT I

IN THE UNITED STATES DISTRICT COURT
FOR THE EASTERN DISTRICT OF PENNSYLVANIA

AGERE SYSTEMS, INC., CYTEC INDUSTRIES INC., FORD MOTOR COMPANY, SPS TECHNOLOGIES, LLC and TI GROUP AUTOMOTIVE SYSTEMS, LLC Plaintiffs, v. ADVANCED ENVIRONMENTAL TECHNOLOGY CORPORATION, et al., Defendants.	Civil Action No. 02-CV-3830 (LDD) **PLAINTIFFS' RESPONSES TO JOINT CONTENTION INTERROGATORIES OF ADVANCED ENVIRONMENTAL TECHNOLOGY CORPORATION, ASHLAND, INC., CARPENTER TECHNOLOGY CORPORATION, feg, inc., HANDY & HARMAN TUBE COMPANY, INC. AND NRM INVESTMENT COMPANY**

Plaintiffs Agere Systems, Inc., Cytec Industries Inc., Ford Motor Company, SPS Technologies, LLC and TI Group Automotive Systems, LLC ("Plaintiffs"), by their undersigned attorneys, object and respond to the joint contention interrogatories of Advanced Environmental Technology Corporation ("AETC"), Ashland, Inc., Carpenter Technology Corporation, feg, inc., Handy & Harman Tube Company, Inc. and NRM Investment Company (collectively, "Defendants") as follows:

GENERAL STATEMENTS AND OBJECTIONS

1. Plaintiffs object to Defendants' Definitions, Instructions and Interrogatories to the extent that they are not "narrowly-tailored contention interrogatories" as permitted by Judge Davis' June 23, 2005 Order.

2. Plaintiffs object to Defendants' Definitions, Instructions and Interrogatories to the extent that they seek information outside the scope of the contentions that Plaintiffs will make as part of their prima facie case at trial. Plaintiffs specifically reserve the right to make any factual

76. What do plaintiffs contend is the Total Cleanup Cost incurred by each plaintiff for each of OU-1 andOU-2?

ANSWER: See Plaintiffs' response to Interrogatory No. 73.

77. Do you contend that any Plaintiff has spent, or is obliged to spend for future costs, amounts in excess of its equitable share of the Total Cleanup Cost?

A. If so, state what each plaintiff contends to be the amount it has already spent and that it will be obliged to spend.

ANSWER: See Plaintiffs' response to Interrogatory No. 73. By way of further answer, see Plaintiffs' response to Interrogatory No. 78.

78. What do plaintiffs contend is Agere's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Agere's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Agere's allocable/equitable share of the Total Cleanup Cost for the Site.

Plaintiffs object to this Interrogatory to the extent that it seeks information outside the scope of the contentions that Plaintiffs will make as part of their prima facie case at trial. Plaintiffs further object to this Interrogatory to the extent that it seeks the discovery of the mental impressions, conclusions, strategies, opinions, research or legal theories of their attorneys or other representatives or information protected by the attorney-client privilege or any other applicable privilege. By way of further objection, Defendants' definition of "factual basis" is overbroad and unduly burdensome.

Without waiving any such objections, Plaintiffs will ask the Court at trial to make findings of fact and conclusions of law based upon testimony and documents Plaintiffs will offer into evidence concerning the hazardous substances owned or possessed by those Defendants who have not settled ("the Non-Settling Defendants") that were disposed of at the Site, by Plaintiffs that were disposed of at the Site, and by Plymouth Tube Company, Quikline Design and

Manufacturing Co., Rohm and Haas Company, Simon Wrecking Co., Inc., Unisys Corporation, United States of America Department of Navy, Novartis Corporation, Techalloy Company, Inc./Rahns Specialty Metals, Inc., and Emhart Industries, Inc./Crown Metro, Inc. ("Settling Defendants") that were disposed of at the Site. Plaintiffs will not ask as part of their case-in-chief that the Court make findings of fact and conclusions of law concerning disposal at the Site of hazardous substances owned or possessed by any other person or entity.

Plaintiffs will ask the Court to make findings of fact concerning the Non-Settling Defendants' total volumes of hazardous wastes that were hauled by DeRewal Chemical Company and/or Environmental Chemical Control (collectively "DCC"). Plaintiffs will then ask the Court to determine the amount of each Non-Settling Defendants' total volume of waste that was disposed of at the Site based upon evidence concerning DCC's handling of all its customer wastes in various time periods ("Nexus Periods") as well as DCC's handling of particular Non-Settling Defendants' wastes. Plaintiffs will ask the Court to conclude that a specific percentage of all wastes handled by DCC in any given Nexus Period was disposed of at the Site, and to apply that percentage to all wastes of Non-Settling Defendants handled by DCC in that Nexus Period. Set forth below is the testimony and documents Plaintiffs intend to offer into evidence for the Court's consideration.

Should the Court adopt Plaintiffs' proposed conclusions that specific percentages of all wastes handled by DCC in any given Nexus Period were disposed of at the Site, then the Plaintiffs expect that the Court will apply the same nexus percentages to the Plaintiffs and Settled Defendant's wastes. Exhibit A attached hereto is a chart showing the total volumes of each Non-Settling Defendant's, each Plaintiff's, and each Settling Defendant's wastes that were hauled by DCC in each Nexus Period ("Gross" on the chart by "Time" period), the nexus

percentages Plaintiffs will ask the Court to find ("Factor" on the chart), and the volumes that the Court will conclude were disposed of at the Site if those nexus percentages are adopted ("Net" on the chart). The entries for "Ashland/AETC" and "Diaz/AETC" show waste that was hauled by DCC from Ashland and Diaz respectively, the transportation for disposal of which those entities and AETC each arranged. Plaintiffs will ask the Court to allocate the "Ashland/AETC" share jointly and severally to Ashland and AETC and the "Diaz/AETC" share to AETC. The entries for "Etched/Flexible" show waste that was hauled by DCC from the Etched Circuits facility for which Flexible is liable.

Plaintiffs will ask the Court to allocate response costs incurred by them up to a date to be set by the Court among Plaintiffs, Non-Settling Defendants, and Settling Defendants only based primarily upon the respective volume of each party's waste that was disposed at the Site (as set forth more fully below). Plaintiffs will also ask the Court for interest on its response costs. Plaintiffs will also ask the Court to apply this allocation to response costs to be incurred by Plaintiffs after that date.

A. Waste Quantities

1. *Nexus Periods*

(a). 1/72 to 12/1/73

Plaintiffs will ask the Court to conclude that 95% of all of the waste handled by DCC beginning in January of 1972 was disposed of at the Site until the opening of DCC's Ontario Street operation in Philadelphia on December 1, 1973. The documents that Plaintiffs intend to rely upon to support this conclusion include, but are not limited to:

- Boarhead Corporation Certificate of Incorporation dated September 2, 1969 [P-5];
- Deed Between Robert and Ruth Buckman and Boarhead Corporation dated October 16, 1969 [P-6];

- DeRewal Chemical Company, Inc. Certificate of Incorporation dated December 29, 1969 [P-7];
- Pennsylvania State Police Investigation Report dated April 26, 1972;
- March 7, 1973 and March 12, 1973 BDOH memorandum;
- Waste Discharge Inspection Report and Site Map dated February 14, 1973 [P-22]
- Waste Discharge Inspection Report dated March 5, 1973 [P-23];
- Agreement Between Boarhead Corporation and Manfred DeRewal dated March 21, 1973 [P-24];
- December 20, 1973 Bucks County Department of Health memorandum;
- PADER November 2, 1973 Order to Boarhead Corporation;
- Waste Discharge Inspection Report dated November 5, 1973
- November 23, 1973 Waste Discharge Inspection Report;
- January 8, 1974 Department of Health Memorandum;
- June 28, 1974 Department of Health memo;
- Complaint in Equity filed on May 31, 1974 in the Court of Common Pleas of Bucks County with an injunction issuing on June 21, 1974;
- Lease Agreement Between Philadelphia Hide Corporation and Manfred DeRewal for 3013-31 East Ontario Street dated November 15, 1973 [P-20]; and
- Affidavit of John Barsum dated April 28, 2000 [D-27].

Plaintiffs also intend to rely upon the testimony of Bruce DeRewal, Freddie DeRewal, Jeff Shaak, John Barsum, John Bean, and June Stephens to support that conclusion. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of the depositions taken in this action of those individuals. Plaintiffs believe that the testimony of those individuals as reflected in those transcripts supports this conclusion, including, but not limited to:

- Bruce DeRewal at 12-38;

- Jeff Shaak at 13-56;
- June Stephens at 20-22, 28-29, 45, 92, 98, 169-71;
- John Bean at 13-24, 45-88;
- John Barsum at 40-43, 51-52, 57-58, 92-93, 206-08, 244-46, 328-30; and
- Freddie DeRewal at 15, 39-58, 129-37.

(b). 12/1/73 to 6/30/75

Plaintiffs will ask the Court to conclude that 15% of all of the waste handled by DCC after the opening of DCC's Ontario Street operation on December 1, 1973 until the closing of Ontario Street on or before June 30, 1975 was disposed at the Site. The documents that Plaintiffs intend to rely upon to support this conclusion include, but are not limited to:

- Lease Agreement Between Philadelphia Hide Corporation and Manfred DeRewal for 3013-31 East Ontario Street dated November 15, 1973 [P-20];
- Letter and Diagram from Thomas J. Kulesza of the City of Philadelphia Water Department to Manfred DeRewal dated September 24, 1974 regarding operations at 3015 E. Ontario Street [P-25];
- Letter from Michael Nelson of the City of Philadelphia Water Department to Manfred DeRewal dated June 2, 1975 regarding cessation of sewer and water services at 3015 E. Ontario Street [P-26];
- June 17, 1975 Philadelphia Water Department letter;
- Waste Discharge Inspection Report dated April 25, 1974;
- Commonwealth of Pennsylvania Complaint in equity on May 28, 1974, which was resolved with an agreed order; and
- February 26, 1975 Waste Discharge Inspection Report.

Plaintiffs also intend to rely upon the testimony of Bruce DeRewal, Freddie DeRewal, Jeff Shaak, John Barsum, John Bean, Manfred DeRewal, and June Stephens to support that conclusion. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of the depositions taken in this action of those

individuals. Plaintiffs believe that the testimony of those individuals as reflected in those transcripts supports that conclusion, including, but not limited to:

- Fred DeRewal at 113-14;
- June Stephens at 28-29, 92-102, 171;
- John Bean at 47-48, 70-80; and
- Bruce DeRewal at 46-47, 55-56.

(c). 7/1/75 to 6/1/76

Plaintiffs will ask the Court to conclude that 65% of all of the waste handled by DCC after the closing of DCC's Ontario Street operation on or before June 30, 1975 and until the opening of DCC's Wissinoming operation on June 1, 1976 was disposed at the Site. The documents that Plaintiffs intend to rely upon to support this conclusion include, but are not limited to:

- Bench opinion filed May 16, 1978 in United States v. Manfred DeRewal, et al. in the United States District Court for the Eastern District of Pennsylvania at Docket No. 77-287;
- Environmental Chemical Control, Inc. Certificate of Incorporation dated October 18, 1976 [P-27];
- July 16, 1975 Waste Discharge Inspection Report;
- Nine criminal complaints filed by BCDOH on January 25, 1976 and February 18, 1976 against Boarhead Corporation and Manfred DeRewal alleging violations of the Pennsylvania Clean Streams Law; and
- Waste Discharge Inspection Report dated April 1, 1976.

Plaintiffs also intend to rely upon the testimony of Bruce DeRewal, Freddie DeRewal, Jeff Shaak, John Barsum, John Bean, Manfred DeRewal, Linda Cochran, and June Stephens to support that conclusion. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of the depositions taken in this action

of those individuals. Plaintiffs believe that the testimony of those individuals as reflected in those transcripts supports that conclusion, including, but not limited to:

- Freddie DeRewal at 51-52, 125-26, 383-91;
- Linda Cochran at 91;
- Fred DeRewal at 115-17; and
- John Bean at 45-70, 80.

(d). 6/1/76 to March 29, 1977

Plaintiffs will ask the Court to conclude that 15% of all of the waste handled by DCC after opening of DCC's Wissinoming operation on June 1, 1976 until March 29, 1977 were disposed of at the Site, except that 25% of the wastes believed by the DCC drivers to consist of nitrating acids were disposed of at the Site during this period. The documents that Plaintiffs intend to rely upon to support this conclusion include, but are not limited to:

- Violation Notice to Ed and Linda Cochron regarding premises located at 5001 Comly Street (Bldg. R) dated April 5, 1977 [P-28];
- Agreement between Manfred DeRewal, Environmental Chemical Control, Inc., Environmental Protection Agency and the City of Philadelphia dated May 12, 1977 [P-29];
- BCDOH "Field Action Report" on July 9, 1976;
- A Waste Discharge Inspection Report dated July 30, 1976;
- Bridgeton Police Department complaint of ammonia odor on September 8, 1976; and
- September 20, 1976 memorandum prepared by Arthur Curley.

Plaintiffs also intend to rely upon the testimony of Bruce DeRewal, Freddie DeRewal, Jeff Shaak, John Barsum, John Bean, Manfred DeRewal, Linda Cochran, and June Stephens to support that conclusion. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of the depositions taken in this action

of those individuals. Plaintiffs believe that the testimony of those individuals as reflected in those transcripts supports that conclusion, including, but not limited to:

- Fred DeRewal at 117-22;
- Bruce DeRewal at 142-43;
- Freddie DeRewal at 328-30; and
- Jeff Shaak at 59-61.

2. *Non-Settling Defendants' Wastes Hauled By DCC*

Carpenter Technology Corporation:

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to Carpenter Technology Corporation include, but are not limited to:

- 6/12/73 contract (Cheri-2) and legal department cover letter (Cheri-1);
- 12/20/73 purchase order (Cheri-3);
- "Waste Acid Removal Cost" chart (Cheri-8);
- "DeRewal Chemical Co. Waste Acid Removal" chart (Cheri-7);
- "DeRewal Chemical Co. 80#228" chart (Cheri-6);
- 10/8/74 Memo (Mann-4);
- 2/25/71 letter (Mann-15);
- Analysis Requests (Mann-3);
- Handwritten notes (Mann-12);
- 7/17/69 Memo (Mann-8);
- 7/8/69 Handwritten telephone note (Adams-2);
- 2/25/70 Memo (Mann-14); and
- Polinko Affidavit.

Plaintiffs also intend to rely upon the testimony of Richard Cheri, William Reger, James Adams, David Mann, Charles Polinko, Robert Elbert, Freddie DeRewal, Bruce DeRewal, June Stevens, John Barsum, and Jurgen H. Exner, Ph.D. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of depositions taken in this action of those individuals, including but not limited to:

- Cheri 24-27, 33-38, 43-50, 52-56, 70-74;
- Reger 13-24;
- Adams 21-23, 35, 48-59, 67-87;
- Mann 19-21, 57-64, 70-74, 81-89, 95, 105-109, 115-17, 127-33, 145-49;
- Elbert 45-47, 67;
- Freddie DeRewal 132-37, 352-53;
- Bruce DeRewal 39-47;
- June Stevens 95-98; and
- John Barsum 51-52, 92-94.

NRM Investment Co.

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to NRM Investment Co. include, but are not limited to:

- 4/87 business confidential response to EPA;
- February 1975 letter to NJDEP;
- Handwritten document from 1977 detailing hauling NRM waste acid;
- Accounts receivable ledger for 1974-75;
- February 2000 letter to Platt, including attachments;
- Handwritten notes from 1976;
- February 1991 interview notes regarding Minthorn;

- Summaries of bills of lading and accounting;
- May 1986 application for discharge permit;
- May 1984 letter to Valley Forge Sewer Authority;
- November 1989 evaluation of cyanide treatment alternatives with attachments;
- April 1986 letter to EPA;
- 1987 engineering records including handwritten calculations and sample results;
- 1988-89 fact sheet and tables;
- May 1989 proposed wastewater treatment plan;
- 1986 handwritten notes re CN;
- 6/88 handwritten notes;
- Schematic of NRM facility;
- Invoices, pick up tickets, summaries of the same, and
- Other correspondence related to hauling of NRM liquid waste.

Plaintiffs also intend to rely upon the testimony of Santo Quici, Frederick Chesky, Peter Freda, Merle Winters, Fred Piotto, Manfred DeRewal, Freddie DeRewal, John Barsum, Jeff Shaak, June Stevens, Bruce DeRewal and Jurgen H. Exner, Ph.D. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of depositions taken in this action of those individuals, including but not limited to:

- Piotti, 13-14, 20-32, 39-47, 50, 55-60, 64-65, 79-83, 86, 93-95, 97-100, 104;
- Quici 15-18, 22-25;
- Chesky 11-14, 16-17, 21-25, 27, 30-31, 36-37, 40-42, 45-48, 52-55, 56-62;
- Freda 9-10, 12-16, 18-24, 27, 30, 37-40, 43-45, 47-78, 57, 62;
- Winters 10-13, 17-18, 21-28, 31, 36-37, 39-40, 42-43, 47, 59, 68-70;
- Manfred DeRewal 157-60, 410-14, 510;

- Freddie DeRewal 47-50, 52, 58-59, 381-84;
- John Barsum 117-20;
- Jeff Shaak 56-64, 113-14;
- June Stevens 90-92; and
- Bruce DeRewal 39, 86-87.

Advanced Environmental Technology Corporation

As to AETC Itself

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to Advanced Environmental Technology Corporation include, but are not limited to, the documents identified with respect to Diaz Chemical Corporation and Ashland Chemical Company below, and the following:

- Correspondence dated August 17, 1976 from ECC to AETC, (AETC51);
- Correspondence dated August 31, 1976 from AETC to DCC, (AETC135);
- Correspondence from AETC to Ashland dated September 28, 1976 (Leuzarder-3);
- Correspondence from John Leuzarder to Manfred DeRewal, dated August 31, 1976, confirming conversation regarding trucking and disposal services (Leuzarder-7);
- DCC invoice dated March 31, 1977 (Leuzarder-9);
- Correspondence dated September 7, 1976 from Leuzarder to DeRewal (Leuzarder-11);
- Correspondence from Susan Lemore to Manfred DeRewal, dated August 23, 1976, confirming conversation regarding required certificate of insurance to be issued to Advanced Environmental Technology Corp. for work to be performed at Ashland Chemical (Leuzarder-13);
- Handwritten notes (undated) referring to sulfuric acid leak at Boarhead Farms (Landmesser-3);

- USEPA's Information Requests to Advanced Environmental Technology Corp. and Advanced Environmental Technology Corporation's Response to Information Requests of USEPA (BSAI022885-022936 and BSAI022975022997);

Plaintiffs also intend to rely upon the testimony of individuals in this case including, but not limited to, the deposition testimony identified with respect to Diaz Chemical Corporation and Ashland Chemical Company below, and the following: Arthur Curley, John Leuzarder and Robert Landmesser. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of depositions taken in this action of those individuals, including, but not limited to:

- Curley: 107, 108, 111, 114-115, 117, 122, 125-130, 157;
- Leuzarder: 37-38, 42, 47, 53, 56-59, 62-68, 70-73, 88-93;
- Landmesser (v.2) 144-147, 151, 154-155, 166-168; (v.1) 56-59, 64-65, 76-78, 86-87, 92, 94-95, 101, 151.

As to Waste from Diaz Chemical Corporation:

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to Diaz Chemical Corporation include, but are not limited to:

- Letter Agreement, dated January 7, 1977, between R.W. Landmesser of Advanced Environmental Technology Corp. and Don Hollwedel of Diaz Chemical Corporation extending services (Landmesser-4);
- Correspondence from H.D. Hollwedel of Diaz Chemical Corporation to Robert Landmesser of Advanced Environmental Technology Corp., dated April 14, 1977, confirming Diaz Chemical Corporation as primary source for disposal of its waste nitration acid (Landmesser-5);
- Invoice, dated March 7, 1977, from Advanced Environmental Technology Corp. to Diaz Chemical Corporation (Landmesser-6);
- USEPA's Information Request to Diaz Chemical Corporation (BSAI029281-BSAI029290; BSAI029291-BSAI029293);
- Diaz Chemical Corporation's Response to Information Request of USEPA (BSAI029140-BSAI029277; BSAI029278-BSAI029280);

- Purchase Order dated 5/16/77 (BSAI029294-BSAI029295)
- Acknowledgment of bill of lading dated 5/28/77 (Leuzarder-12);
- Receipts (variously dated) (BSAI029297-BSAI029301)
- Handwritten notes (BSAI029302)
- Portion of document indicating the amount of money and waste streams that were sent to DCC from Ashland Chemical and Diaz (AETC197-199)

Plaintiffs also intend to rely upon the testimony of individuals in this case including, but not limited to, the following: Theodore Jenney, Stanley Chiras, Diane Shampine, Robert Landmesser, John Leuzarder and Jurgen H. Exner, Ph.D. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of depositions taken in this action of those individuals, including, but not limited to:

- Jenney: 32-49;
- Chiras: 20-26, 34-41; 62, 73;
- Shampine: 19-23; and
- Landmesser: (v.2) 161, 177, 185-192, (v.3) 41-42, 46.

Ashland, Inc.

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to Ashland, Inc. include, but are not limited to:

- Correspondence from R.T. Olsen of Ashland Chemical Company to Andrea Barnhouse of A.B.M. Disposal Company, dated August 4, 1976, regarding "best estimate" analysis of its A.C.C. Code 616-220 CDN Spent Acid (ASHL00004);
- Bills of lading, dated 8/9/76-4/12/77 (ASHL00005-00010; ASHL00037-00044; ASHL00048-00065; ASHL00070-00072; ASHL00075-00084; ASHL00000087-00089; ASHL00091-00099; ASHL00105-00110; ASHL00113-00118; ASHL00120-00121; ASHL00124-00126; ASHL00128-00129; ASHL00131; ASHL00133-00139; ASHL00142-00143; ASHL00145-00146; ASHL00148; ASHL00150; ASHL00152; ASHL00154; ASHL00156; ASHL00163-00164; ASHL00166; ASHL00168; ASHL00170; ASHL00172; ASHL00174; ASHL00176; ASHL00178-00180; ASHL00182; ASHL00184; ASHL00186-

00187; ASHL00192-00195; ASHL00197-00212; ASHL00215; ASHL00217-00231; ASHL00233-00234; ASHL00239; ASHL00246-00249; ASHL00251-00252);

- Memorandum from A.T. Curley to W.R. Starkey dated September 16, 1976 (ASHL00066-00069);
- USEPA's Information Requests to Ashland Chemical Company and Ashland Responses to USEPA Information Requests (ASHL00313-ASHL00472 and BSAI005140-005142);
- Invoice from DeRewal Chemical Co., Inc. to Advanced Environmental Tech., dated 4/9/77 (ASHL00249);
- Portions of waste ledger sheets (BSAI024255-024256; BSAI024275-024276; BSAI033916; BSAI033932; BSAI033937-033938; BSAI034142-034143; BSAI034201);
- Bill of lading, dated 4/28/77 (BSAI024001);
- Correspondence from John Leuzarder of Advanced Technology, Inc. to Art Curley of Ashland Chemical Co., dated August 3, 1976 regarding pricing on various waste streams (Curley -1);
- Memorandum, dated August 23, 1976, from A.T. Curley to W. R. Starkey regarding waste chemical disposal (Curley-2);
- Agreement between Advanced Environmental Technology, Inc. and Ashland Chemical Company, undated and unsigned (Curley-4);
- Memorandum to file, dated September 20, 1976, from A.T. Curley regarding visit with current spent acid disposer (Curley-5);
- Memorandum, dated October 19, 1976, from A.T. Curley to J. Minott/W.R. Starkey regarding visit to disposal site for its CDN spent acid (Curley-6);
- Memorandum, dated April 14, 1977, from A.T. Curley to W.R. Starkey regarding CDN spent acid disposal (Curley-8);
- Memorandum, dated May 18, 1977, from A.T. Curley to T. Bailey regarding waste disposal (Curley-9);
- Portion of waste ledger sheet for April 1977 (Curley-11);
- Correspondence from John Leuzarder of Advanced Environmental Technology Corp., Inc. to Art Curley of Ashland Chemical Corporation, dated August 16,

1976, offering reduced pricing on two items covered in its quote of August 3, 1976 (Curley-16);

- Correspondence from Arthur Curley of Ashland Chemical Company to John Leuzarder of Advanced Environmental Technology Corp., Inc., dated October 26, 1976, regarding freeze point of its spent acid (Curley-17);
- Correspondence from John Leuzarder of Advanced Environmental Technology Corp., Inc. to Art Curley of Ashland Chemical Company, dated September 28, 1976, providing quote on extension of services (Curley-18);
- Bill of lading, dated 9/8/76 (C. Hendershot-5);
- Bill of lading, dated 11/4/76 (C. Hendershot-8);
- "Totals Paid DeRewal", (AETC197-199; Leuzarder-5);
- Photographs regarding Ashland Chemical drums and labels found at the site; and
- Sample results regarding contents of drums with Ashland Chemical labels

Plaintiffs also intend to rely upon the testimony of individuals in this case including, but not limited to, the following: Arthur Curley, John Leuzarder, Robert Landmesser, Charles R. Wilcox, Howard L. Hendershot, Charles Hendershot, Alberto Celleri, Freddie DeRewal, John Barsum, Jeff Shaak, Bruce DeRewal, June Stevens, Jurgen H. Exner, Ph.D and Craig Coslett and Geoffrey Siebel of de maximis, inc. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of depositions taken in this action of those individuals, including, but not limited to:

- Curley 44, 46-51, 53-54, 57, 59-60, 71, 110, 133-139, 141-145, 149-148, 167, 193;
- Wilcox 35-36, 37, 72;
- L. Hendershot 21;
- C. Hendershot 31-32, 36, 86, 89, 95;
- Celleri 23-24, 28-29;
- Freddie DeRewal 65-69;

- Jeff Shaak 65-68;
- John Barsum 180-84;
- Bruce DeRewal 80-83; and
- June Stevens 88-89.

Plaintiffs also intend to offer into evidence the transcripts of depositions taken in other cases, including the deposition of William C. Olasin taken on May 14, 2001 in *Rohm and Haas Co. v. American Cyanamid Co., et al.*, No. 95-1864 and 99-1891 (D.N.J.) 72-75, 158, 201; and the deposition of Arthur Curley taken on August 21, 1996 in *U.S. v. Davis, et al.*, No. 90-0484/P (D.R.I.) 35-37, 42, 62-63, 68-69, 83, 90, 108-111, 139-180, 201-205.

fcg, inc.

As to Waste From Flexible Circuit Facility:

- All documents recovered from the Bucks County Department of Health files for Flexible Circuits, produced at Bates Range BSA1082378-082771, including, but not limited to, a March 1968 Valley Sewer Authority sample; a June 1968 letter from Edwin Faunce to Flexible Circuits; follow up letters from 10/15/68, 10/16/68, 10/16/68; a February 27, 1969 letter from Flexible Circuits to the PA DER; follow up correspondence between Flexible Circuits and state agencies on 5/15/70; 6/18/70 handwritten notes; 7/7/70 letter from Melvin Bach; a July 1970 proposal from Udylite; 10/10/70 inspection report; 1/29/71 and 2/22/71 inspection reports and samples; 2/10/71 letter; 7/7/71 complaint; 1/10/72 letter from DeRewal; 5/2/72 and 6/13/72 inspection reports; 6/15/72, 6/19/72, 6/23/72, 7/3/72 letters; 7/10/72, 8/8/72 inspection reports; 7/26/72 letter; 8/17/72 and 9/5/72 reports; a 10/72 agreement; 10/19/72 and 10/25/72 inspection reports; 1/12/73 and 3/12/73 inspection reports; 9/9/74 inspection report; 1/9/75 inspection report; 6/10/77 handwritten notes from BCDH; 9/21/77 and 11/21/77 letters; 4/6/79, 5/24/79, 5/25/79 and 5/29/79 reports and 5/31/79 response letter; 8/16/79 memo to DER; 10/16/79 letter; 10/17/79 handwritten notes; 2/20/80 letter; 5/5/82 handwritten notes; 6/16/82 letter; 11/3/82 letter; 2/1/83 letter and 1984 handwritten notes; 10/4/84 letter; 1992 inspection report.
- Additional documents not from the Bucks County Department of Health files for Flexible Circuits include 11/6/87 letter from Stollsteimer to EPA; a 10/2/87 letter from Bach to EPA; 9/11/87 letter from Bach to EPA; handwritten notes detailing DeRewal purchases and payments; 10/13/87 handwritten notes by Zia; 1/10/72 letter from DeRewal; 9/22/00 letter from Barbin to EPA; 1/27/86 letter and PPC Plan; 5/27/83 letter; undated Flexible Circuits Inc's promotional materials; the

Flexible Circuits' 1969 Annual Report, multiple DeRewal invoice's and pickup tickets 1973-75.

Plaintiffs also intend to rely upon the testimony of Melvin Bach, George Stollsteimer, Peter Knoll, Ralph Parker, Richard Yeatman, Freddie DeRewal, June Stevens, John Bean, Bruce DeRewal, John Barsum, Jeff Shaak and Jurgen H. Exner, Ph.D. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of depositions taken in this action of those individuals, including but not limited to:

- Bach 8, 15-20, 21-26, 27-30, 34-36, 38, 43, 49-56, 58-63, 65-66, 68, 71-73, 75, 80, 83, 86-89;
- Stollsteimer 10-13, 16-19, 23-25, 30-33, 35, 37, 39-41, 43, 53-61, 63-64, 66-67, 70-71, 77-80, 85-87, 92-94;
- Freddie DeRewal 8-88, 127-29;
- June Stevens 78-83, 107;
- John Bean 60-61;
- Bruce DeRewal 77-79;
- John Barsum 111-18, 154-60, 137-40, 179-80; and
- Jeff Shaak 29-31, 86-87.

As to Waste From Etched Circuits Facility:

- All of the documents and testimony listed under Flexible Circuits and in addition, to rely on a 10/2/87 letter from Bach to EPA; 10/24/70 meeting minutes; 4/25/70 meeting notes; 11/2/77 field representative waste survey report; 3/2/73 letter; 9/11/87 letter; 9/4/90 GIS submission; DeRewal invoices; 11/15/88 Inspection Report, 9/28/2000 response to EPA.

Handy & Harman Tube Company, Inc.

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to Handy & Harman Tube Company, Inc. include, but are not limited to:

- 1/7/93 letter to EPA;

- September 1992 Site Investigation;
- 10/29/92 letter to EPA;
- February 1973 DCC invoice;
- Interview notes of Jay Crawford, Mary Kollmar, Thomas Curran; and
- Handy & Harman interrogatory responses.

Plaintiffs also intend to rely upon the testimony of Jay Crawford, Mary Kollmar, Thomas Curran, James McElya, Bruce DeRewal, Freddie DeRewal, John Barsum and Jurgen H. Exner, Ph.D. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of depositions taken in this action of those individuals, including but not limited to:

- Curran 31-32, 48-49, 52-56, 61, 71-71, 84;
- Kollmar 24;
- Bruce DeRewal 43-56;
- Freddie DeRewal 119-23, 397; and
- John Barsum 122, 326-328.

3. *Settling Defendants' Waste Hauled By DCC*

Rohm and Haas: There are no documents and no testimony establishing that DCC ever hauled waste from Rohm and Haas.

Unisys:

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to Unisys include, but are not limited to:

- 4/30/72 Invoice to Univac (P-18)
- January 21, 1972 DCC letter to Univac (P-16)
- 3/6/73 Remington Rand Purchase Order

- 4/27/73 Univac Purchase Order

Plymouth Tube:

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to Plymouth Tube include, but are not limited to:

- November 27, 1972 DCC letter to Carpenter Technology (P-32);
- January 10, 1973 letter from Hugh Hawk to EPA;
- DCC invoices dated 1976 (P-15);
- May 24, 1977 letter from Hugh Hawk to PADER.

Quikline Design and Manufacturing Co.:

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to Quikline Design and Manufacturing Co. include, but are not limited to:

- March 1973 DCC Invoice;
- March 2, 1973 letter from DeRewal to Marchewka; and
- 1978 Waste Survey Report

Plaintiffs also intend to rely upon the testimony of Manfred DeRewal and Freddie DeRewal. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of depositions taken in this action of those individuals, including but not limited to:

- Manfred DeRewal at 150-152
- Freddie DeRewal at 361-367

United States Navy:

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to the United States Navy include, but are not limited to:

- 5/17/76 Fumara letter; and

- 9/7/76 Lynn letter

Plaintiffs also intend to rely upon the testimony of Freddie DeRewal. Should Freddie DeRewal be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of his depositions taken in this action, including but not limited to:

- Freddie DeRewal at 107-10, 368-69

Simon Wrecking Co., Inc.: There are no documents to permit any estimate of total volume of waste hauled in any time period by DCC from Simon Wrecking.

Plaintiffs intend to rely upon the testimony of Freddie DeRewal. Should Freddie DeRewal be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of his depositions taken in this action, including but not limited to:

- Freddie DeRewal at 112-16, 158-61, 421-22, 423-28

Crown Metro/Emhart:

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to Crown Metro/Emhart include, but are not limited to:

- 12/1/76 DCC letter to Bostik South; and
- 2/25/77 Bostik South letter to DCC

Plaintiffs intend to rely upon the testimony of Freddie DeRewal and Jeffrey Shaak. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of depositions taken in this action of those individuals, including but not limited to:

- Freddie DeRewal at 116-119, 353-361
- Jeff Shaak at 81-83

Novartis:

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to Novartis include, but are not limited to:

- Ciba-Geigy shipping documents (D-25)
- Ciba-Geigy 6/6/76 Purchase Order (D-26)

Thomas & Betts Corporation: There are no documents and testimony establishing that DCC hauled waste from Thomas & Betts after January 1, 1972.

Techalloy/Rahns:

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to Techalloy/Rahns include, but are not limited to:

- August 1972 DCC invoice to Techalloy (P-37);
- July 14, 1972 DCC quotation letter to Techalloy;
- October 12, 1972 Techalloy letter to PADER (RAHN 0288);
- 11/26/73 Techalloy purchase order to Liquid Removal Service;
- DCC time card for Bruce DeRewal dated 9/21/73;
- DCC time cards for "Walt" dated 11/26 and 11/27/73;
- 5/16/73 PADER Waste Discharge Inspection Report of Techalloy (RAHN-521);
- 10/17/73 PADER Regional Engineer's Review of Techalloy (RAHN-0592-93);
- 6/5/72 Waste Inspection Report of Techalloy;
- August 20, 1971 PADER Waste Discharge Inspection Report of Techalloy (RAHN-0622);
- Techalloy 104(e) response to EPA;
- February 1973 portions of Techalloy accounts payable register (Senin-2);
- Sanitary Sewerage System, Drawing No. S-10 (Moran-1);
- Application for Plumbing Permit to Connect Building to Public Sewer (Moran-2 and RAHN 1251-59); and

- Portions of Weston Technical Report (RATN-0539- RATN0555)

Plaintiffs intend to rely upon the testimony of Theodore Hahn, John T. Moran, Sr., Freddie DeRewal, Bruce DeRewal, June Stephens, John Bean, and William J. Lehane. Should one or more of those individuals be unavailable to testify at trial, Plaintiffs intend to offer into evidence the transcripts of depositions taken in this action of those individuals, including but not limited to:

- Theodore Hahn at 12-38, 47-51, 59-61, 70-78;
- John T. Moran, Sr.;
- Freddie DeRewal at 129-32
- Bruce DeRewal at 13-16, 35
- June Stephens at 20-22, 63-64, 72-73
- John Bean at 41-46, 59-60
- William J. Lehane, Esquire, Drinker Biddle & Reath

4. *Plaintiffs' Waste Hauled By DCC*

Agere Systems, Inc.

There are no documents and no testimony establishing that any hazardous waste owned or possessed by Agere's predecessor, Western Electric, was disposed at the Site.

Cytec Industries Inc.

American Cyanamid was never a customer of DCC. Rather, records indicate that Marvin Jonas hauled waste for American Cyanamid during the 1970s. The Jonas records reflect, however, that DCC collected on Jonas' behalf American Cyanamid waste in two distinct time periods. The documents that Plaintiffs intend to rely upon to support their conclusions with respect to Cytec include, but are not limited to:

- February 18, 1975 Jonas, Incorporated report to NJDEP otherwise known as "Phylis Jonas Grid", which was identified as Jonas-14 during the June 21, 1995 deposition of Marvin Jonas in the Buzby landfill litigation;

- Marvin Jonas, Inc. Registration Statement for a Solid/Liquid Waste Collector-Hauler dated March 31, 1975, which was identified as Jonas-15 during the June 21, 1995 deposition of Marvin Jonas in the Buzby landfill litigation;

- Marvin Jonas, Portions of Marvin Jonas' handwritten transactional ledger for the year 1976, which are Bates-stamped BSA1071668-BSA1071670;

- Marvin Jonas, Inc. Registration Statement for a Solid/Liquid Waste Collector-Hauler dated May 26, 1977, which was identified as Jonas-11 during the June 21, 1995 deposition of Marvin Jonas in the Buzby landfill litigation;

- American Cyanamid responses to EPA 104(e) Information Requests;

- April 14, 1992 correspondence from Margaret Tribble at American Cyanamid Company to Martha Wilkie Murray at Peterson Consulting Company and attached affidavits from Jonas employees.

Plaintiffs also intend to offer into evidence the transcripts of Marvin Jonas' depositions in the Buzby landfill litigation.

SPS Technologies, LLC

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to SPS Technologies, LLC include, but are not limited to:

- SPS purchase orders, DCC shipping orders and DCC invoices (SPST00137-155, SPST00165-176 and SPST00234;

- November 3, 1992 response to EPA 104(e) Information Request (SPST00090); and

- February 5, 1996 response to EPA 104(e) Information Request (SPST00182);

TI Group Automotive Systems, LLC

There are no documents and no testimony establishing that any hazardous waste owned or possessed by Bundy Corporation was disposed at the Site or was hauled by DCC.

Ford Motor Company

The documents that Plaintiffs intend to rely upon to support their conclusions with respect to Ford Motor Company include, but are not limited to:

- DCC invoices and Ford purchase orders (FORD000009, FORD00010-12, FORD000016, FORD000032-000121, FORD000128, FORD000130-132, FORD000134;
- January 21, 1972 letter from DCC to Mike Margarite (FORD000123);
- Responses to EPA 104(e) Information Requests (FORD000016); and
- Analytical Sampling Results (FORD000032-000121); and
- Waste Characterization Report dated September 26, 2003

Plaintiffs also intend to rely upon the testimony of Craig Coslett and/or Geoffrey Siebel of de maximis, inc.

B. Allocation

Plaintiffs will ask the Court at trial to allocate response costs primarily based upon the equitable factor of volume of wastes of Plaintiffs, Non-Settling Defendants, and Settling Defendants that were disposed of at the Site. Plaintiffs will also ask the Court at trial to increase the allocation to AETC and Ashland by 10% because those parties knew that Manfred DeRewal had a history of pollution violations and that he intended to dispose of Ashland waste at the Site and because AETC knew that he was in fact disposing of those wastes at the Site. Plaintiffs will also ask the Court at trial to increase the allocation to Carpenter by 10% because Carpenter knew before it contracted with DCC in 1973 to remove Carpenter's wastes that Manfred DeRewal was a principal in DCC and that he had a history of pollution violations. Plaintiffs will also ask the Court at trial to decrease Plaintiffs' share by 50% based upon the fact that Plaintiffs have cooperated with EPA and the Commonwealth of Pennsylvania by, inter alia, settling EPA's past costs claim and conducting the response actions required by the OU-1 and OU-2 Consent

Decrees and because the Non-Settling Defendants did not do so, despite having received notice letters from EPA.

Plaintiffs intend to rely upon the following documents and testimony to support these conclusions:

- Documents and testimony concerning the knowledge and conduct of AETC, Ashland, and Carpenter as set forth in the section "Non-Settling Defendants Wastes Hauled by DCC" above;
- Documents and testimony in the Administrative Record establishing the reasons for EPA's initial response activities at the Site, the study and analysis by EPA of a multitude of COPCs identified at the Site in the RI/FS and otherwise, the distribution of inorganic and organic compounds in soils throughout the Site, EPA's Record of Decision and the process leading to the ROD, and the response actions taken by EPA;
- Testimony of Jay Vandeven (including documents referenced in his expert reports);
- Consent Decrees entered with respect to the Site on or about September 28, 2000 and March 14, 2002.
- Defendants received General Notice Letter and Special Notice Letters from EPA as follows: AETC, Ashland, NRM Investment Company - General Notice Letters in May and July 1989; Carpenter, Etched Circuits, fcg, inc., Handy & Harman - General/Special Notice Letters in September 2000.

Exhibit B attached hereto is a chart showing the volumes that the Court will conclude were disposed of at the Site based upon Exhibit A, and the shares Plaintiffs will ask the Court to allocate to Plaintiffs collectively (based upon aggregating their individual shares, if any, and the individual shares of the Settling Defendants, if any) and to each Non-Settling Defendant. Specifically, the volumetric shares of Carpenter, Ashland/AETC, and AETC (for Diaz waste) were increased by 10% each, and the volumetric shares of all other entities were decreased pro-rata by the total amount of the increase ("Increase to PRPs with Knowledge" on chart). The share otherwise attributable to Plaintiffs was then reduced by 50% and the volumetric shares of the Non-Settling Defendants were increased pro-rata by the total amount of the decrease ("50%

Cooperation Credit to Plaintiffs" on chart). This column sets forth the share Plaintiffs will ask the Court to allocate to each entity.

79. What do plaintiffs contend is Cytec's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Cytec's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Cytec's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

80. What do plaintiffs contend is Ford's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Ford's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Ford's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

81. What do plaintiffs contend is SPS' allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to SPS' allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to SPS' allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

82. What do plaintiffs contend is TI's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to TI's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to TI's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

83. What do plaintiffs contend is AETC's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to AETC's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to AETC's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

84. What do plaintiffs contend is Ashland's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Ashland's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Ashland's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

85. What do plaintiffs contend is Boarhead's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Boarhead's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Boarhead's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78. By way of further response, Boarhead Corporation has no identifiable assets that would enable it to participate financially in the cleanup of the Site. By way of further response, see June 29, 2006 expert report of Raymond F. Dovell, C.P.A. previously produced and documents referenced therein. By way of further response, Boarhead Corporation is not a party to this action.

86. What do plaintiffs contend is Carpenter's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Carpenter's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Carpenter's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

87. What do plaintiffs contend is Crown's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Crown's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Crown's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

88. What do plaintiffs contend is Diaz's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Diaz's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Diaz's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78. By way of further response, Diaz Chemical Corporation has no identifiable assets that would enable it to participate financially in the cleanup of the Site. By way of further response, see June 29, 2006 expert report of Raymond F. Dovell, C.P.A. previously produced and documents referenced therein.

89. What do plaintiffs contend is Etched's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Etched's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Etched's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

90. What do plaintiffs contend is fcg's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to feg's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to feg's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

91. What do plaintiffs contend is H&H's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to H&H's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to H&H's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

92. What do plaintiffs contend is Knoll's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Knoll's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Knoll's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78. By way of further response, Knoll, Inc. has no successor liability for any waste disposed of at the Site from the Art Metal-Knoll Corporation East Greenville, Pennsylvania facility. Art Metal-Knoll Corporation (now Trace International) has no identifiable assets that would enable it to participate financially in the cleanup of the Site. By way of further response, see June 29, 2006 expert report of Raymond F. Dovell, C.P.A. previously produced and documents referenced therein.

93. What do plaintiffs contend is Merit Metals' allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Merit Metals' allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Merit Metals' allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78. By way of further response, Merit Metal Products Corp. has no successor liability for any waste disposed of at the Site from the Merit Metal-Products Corporation Warrington, Pennsylvania facility. Merit Metal Products Corporation (now Leonards II Co., Inc.) has no identifiable assets that would enable it to participate financially in the cleanup of the Site. By way of further response, see June 29, 2006 expert report of Raymond F. Dovell, C.P.A. previously produced and documents referenced therein.

94. What do plaintiffs contend is Novartis' allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Novartis' allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Novartis' allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

95. What do plaintiffs contend is NRM's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to NRM's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to NRM's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

96. What do plaintiffs contend is Plymouth's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Plymouth's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Plymouth's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

97. What do plaintiffs contend is Quickline's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Quickline's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Quickline's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

98. What do plaintiffs contend is RSM's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to RSM's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to RSM's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

99. What do plaintiffs contend is R&H's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to R&H's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to R&H's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

100. What do plaintiffs contend is Simon's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Simon's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Simon's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

101. What do plaintiffs contend is T&B's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to T&B's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to T&B's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

102. What do plaintiffs contend is Unisys' allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Unisys' allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Unisys' allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

103. What do plaintiffs contend is Navy's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Navy's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Navy's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78.

104. What do plaintiffs contend is Haven's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Haven's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Haven's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78. By way of further response, Haven Chemical, Inc. and Haven Industries, Inc. have no identifiable assets that would enable them to participate financially in the cleanup of the Site. By way of further response, see June 29, 2006 expert report of Raymond F. Dovell, C.P.A. previously produced and documents

referenced therein. By way of further response, Haven Chemical Inc. and Haven Industries, Inc. are not parties to this action.

105. What do plaintiffs contend is Envirotec's [sic] allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Envirotec's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Envirotec's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78. By way of further response, Enviratec, Inc. has no identifiable assets that would enable it to participate financially in the cleanup of the Site. By way of further response, see June 29, 2006 expert report of Raymond F. Dovell, C.P.A. previously produced and documents referenced therein. By way of further response, Enviratec, Inc. is not a party to this action.

106. What do plaintiffs contend is Sitkin's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Sitkin's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Sitkin's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78. By way of further response, Sitkin Smelting & Refining, Inc. has no identifiable assets that would enable it to participate financially in the cleanup of the Site. By way of further response, see June 29, 2006 expert report of Raymond F. Dovell, C.P.A. previously produced and documents referenced therein. By way of further response, Sitkin Smelting & Refining, Inc. is not a party to this action.

107. What do plaintiffs contend is Trace's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Trace's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Trace's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: Art Metal-Knoll Corporation (now Trace International) has no identifiable assets that would enable it to participate financially in the cleanup of the Site. By way of further response, see June 29, 2006 expert report of Raymond F. Dovell, C.P.A. previously produced and documents referenced therein. By way of further response, Trace International is not a party to this action.

108. What do plaintiffs contend is General Ceramics' allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to General Ceramics' allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to General Ceramics" allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78. By way of further response, General Ceramics is not a party to this action. By way of further response, General Ceramics conducted a removal action in which it removed, to EPA's satisfaction, any wastes for which it might be liable.

109. What do plaintiffs contend is DeRewal's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to DeRewal's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to DeRewal's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78. By way of further response, Manfred DeRewal, Sr. has no identifiable assets that would enable him to participate financially in the cleanup of the Site. By way of further response, see June 29, 2006 expert

report of Raymond F. Dovell, C.P.A. previously produced and documents referenced therein. By way of further response, Manfred DeRewal, Sr. is not a party to this action.

110. What do plaintiffs contend is DCC's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to DCC's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to DCC's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78. By way of further response, DeRewal Chemical Company, Inc. has no identifiable assets that would enable it to participate financially in the cleanup of the Site. By way of further response, see June 29, 2006 expert report of Raymond F. Dovell, C.P.A. previously produced and documents referenced therein. By way of further response, DeRewal Chemical Company, Inc. is not a party to this action.

111. What do plaintiffs contend is Globe's allocable/equitable share of the Total Cleanup Cost for the Site (expressed in a percentage)?

A. What is the factual basis for plaintiffs' contention as to Globe's allocable/equitable share of the Total Cleanup Cost for the Site?

B. Set forth the calculation used by plaintiffs to arrive at their contention as to Globe's allocable/equitable share of the Total Cleanup Cost for the Site.

ANSWER: See Plaintiffs' response to Interrogatory No. 78. By way of further response, Globe Disposal Company, Inc. has no identifiable assets that would enable it to participate financially in the cleanup of the Site. By way of further response, see June 29, 2006 expert report of Raymond F. Dovell, C.P.A. previously produced and documents referenced therein. By way of further response, Globe Disposal Company, Inc. is not a party to this action.

112. Do plaintiffs contend that the first removal action conducted by the United States (as that removal action is described in the first paragraph of page 3 of the Record of Decision for the Site) was not completed in 1992?

EXHIBIT J

REPORT OF EXPERT WITNESS

BOARHEAD FARM AGREEMENT GROUP V. ADVANCED ENVIRONMENTAL TECHNOLOGY CORPORATION, ET AL.

Submitted by Jurgen H. Exner, Ph.D.

JHE Technology Systems, Inc.
2 Waverly Ct.
Alamo, CA 94507

June 29, 2006

1. SUMMARY OF BASIS OF OPINION

The following opinions are based upon my professional experience, described in detail in section 5, in the fields of chemistry, process development, hazardous waste production, waste management, and hazardous waste site investigation and remediation. In addition, documents referenced in section 3 were used in developing these opinions.

2. STATEMENT AND BASIS OF OPINIONS

I have reviewed the cited documents describing manufacturing processes and chemicals used by the companies described below. I have used the information and my experience to identify the types of wastes that were generated by the companies' manufacturing processes and to estimate the approximate composition of the waste streams.

Chemical wastes generally arise during the following operations:

- Chemical reaction
- Hydrolysis or neutralization of the reaction mixture
- Product purification by crystallization, decolorization, clarification, precipitation, distillation, or extraction
- Separation of solids by filtration
- Separation of liquids by phase separation, distillation, or steam stripping
- Drying, blending, and formulating
- Spills, leaks, and equipment cleaning

The companies processing steel and those manufacturing metal parts and printed circuit boards used specific processes that generated wastes from acid pickling and plating. These operations also generated rinsate wastes, spills, spent reagent baths, and sludges. Lubrication of metals and degreasing also formed residual oil and grease wastes and chemical wastes containing solvents such as trichloroethylene (TCE) consistent with the specific process.

I used available information to define the processes used during the 1970's, the types of wastes that were produced from these processes, and the manner in which the wastes were collected to form an opinion about the wastes that each company generated and disposed of off-site.

CHEMICAL PROCESSING

Diaz and Ashland manufactured selected chemicals in batch mode according to market demand. Such operation generates chemically contaminated waste streams from the following activities:

1. Chemical processing. During chemical reactions, the desired product is formed concurrently with by-products. Consequently, purification/separation steps are necessary. Separation of the product from reagents and by-products by a variety of purification steps leaves behind liquid and solid chemical process wastes. Such wastes may include crystallization mother liquors, process water washes, extraction solvents, spent catalysts, spent adsorbent and drying agents, product purification filter cakes, distillation residues, distillation overheads, scrubber solutions, and vacuum system condensates.

2. General equipment operation. Chemical wastes from this category include improper phase separations, unwanted emulsions, cleaning of equipment, cleanup of spills, spills to land from leakage of pipes, pumps, and valves, laboratory wastes, disposal of old equipment and insulation, and housekeeping wastes.

Each chemical process generates a variable quantity of chemical waste per pound of product depending on the efficiency of the chemical reaction and the attention of operators. Chemical process wastes are affected by the selectivity of the chemical reaction, choice of reagents, difficulty of purification and separation, recycle and re-use of reagents and solvents, water re-use or pre-treatment, and equipment configuration.

DIAZ CHEMICAL CORPORATION

During the period of 1975 through 1977, Diaz Chemical Corporation manufactured custom chemicals. The primary product, 4-chloro-3,5-dinitrobenzotrifluoride (CDNBF), was manufactured in 2,000-gal reactors by the successive nitration of 4-chlorobenzotrifluoride (CBF). The nitration was carried out in two stages [Chiras deposition]. In the first step, CBF was converted to 4-chloronitrobenzotrifluoride (CNBF). In the second step, an excess of nitric acid, sulfur trioxide, and sulfuric acid converted the mono-nitrated material to CDNBF. The excess acid layer was separated and used to nitrate a new batch of CBF. After this recycled acid stream formed the mono-nitrated intermediate, the acid stream was separated from the organic layer. This organic layer was then treated with a new batch of fresh acid solution. The CDNBF was washed with water and low concentration alkali solution [Chiras]. A patent of the period describes this process [Schneider, L., Graham, D.E., US Patent 4,096, 195, June 20, 1978].

Each batch of CDNBF produced about 1,000 gal of spent acid waste consisting of about 83 % sulfuric acid, about 3 % nitric acid, 10-12 % of water, and about 2 –4 % organic material [BSAI 029271, BSAI 029272] . The organic impurities in the acid waste were likely CNBF, sulfonated

CNBF, chlorobenzoic acid, chloro-nitrobenzoic acid, and CDNBF [BSAI 029140]. Organic impurities likely varied depending on batch operating conditions such as reaction time, care in carrying out phase separations, and temperature. The teachings of the patent produce a calculated, spent acid waste stream of about 82 % sulfuric acid, 3 % of nitric acid, 12 % of water, and 3 % of waste organic. These wastes were disposed of off-site [Landmesser deposition V 2].

Wash waters for each batch were about 360 gal [BSAI 029279] containing low concentrations of sodium sulfate, nitrate, and probably less than about 0.3 % of the waste organic constituents.

During the period of 1975-1977, Diaz produced spent acid waste consisting of about 83 % of sulfuric acid, 3 % nitric acid, 10-12 % water, and 2-4 % of organic material. This waste was disposed of off-site. In addition, Diaz produced wash waters containing salts and low concentrations of organic compounds.

ASHLAND CHEMICAL COMPANY

During the period of 1975-77, Ashland Chemical Company's Great Meadows plant in New Jersey manufactured a wide variety of custom chemicals for outside clients. Yearly production of 25-30 products was carried out in 100-4,000-gal reactors in batch mode. Wastes formed during the production would have been defined by specific processing for each product and was representative of methods used in custom manufacturing during this time period. Primary sources of wastes requiring disposal would be expected to be solvents such as water, hydrocarbons, or alcohols that were used as reaction media or for purification of the products. These solvents would be expected to contain excess reagents, reaction by-products or other impurities. Recovery of solvents by distillation would yield distillation residues containing solvent, reaction products, and product. Products, solvents, reagents, and by-products from spills and from reactor and line cleanout would produce waste material for disposal. Occasional off-specification product would require disposal if the material was unsuitable for blending with fresh product.

4-chloro-3, 5-dinitrobenzotrifluoride (CDNBF)

The largest quantity of material produced during this time period was CDNBF, an intermediate for various herbicides. CDNBF was produced by nitration of chlorobenzotrifluoride in 4,000-gal reactors. An average of 1.5 batches per day were doable [Curley, 96, p. 138] . At the conclusion of the nitration reaction, spent acid, about 2,400 gal/batch [Curley 04] was separated from the product. This spent acid contained about 83 % sulfuric acid, 3.5 % nitric acid, 0.1 % hydrogen fluoride, about 10 % water, and about 3-4 % of organic compounds [ASHL00002-3, ASHL00004]. Organic compounds in the acid waste would be chloronitrobenzotrifluoride (CNBF), sulfonated CNBF, chlorobenzoic acid, chloronitrobenzoic acid, and CDNBF. The amount and composition of organic impurities would depend on batch operating conditions such as reaction time, care in carrying out phase separations, and temperature. The composition of the waste is consistent with the teachings of a patent of the time [Schneider]. Calculating the waste stream composition from the patent gives a spent acid waste stream of about 82 % sulfuric acid,

3 % of nitric acid, 12 % of water, and 3 % of waste organic compounds, very similar to the composition described above.

CDNBF product was subsequently washed to remove and neutralize residual acid. Wash waters for each batch were about 800 gal [BSAI 0033355, Curley 11] and would contain low concentrations of sodium sulfate, sodium nitrate, and less than about 0.3 % of the waste organic constituents.

During the period of 1976-1977, Ashland produced large quantities of spent acid waste consisting of about 83 % of sulfuric acid, 3 % nitric acid, 10 % water, and 3-4 % of organic material. This waste was disposed of off-site. In addition, Ashland produced large quantities of wash waters containing salts and low concentrations of organic compounds.

Dyes

During the period of 1976-1977, Ashland produced 8-15 hair dyes and intermediates for Clairol [Curley, 04, p.35]. Clairol hair dyes in 1970 included the following compounds [Ames, B.N., Kammen, H.O., Yamasaki, E., 1975, "Hair Dyes are Mutagenic: Identification of a Variety of Mutagenic Ingredients," Proc. Nat. Acad. Sci. USA, 72, 2423-2427; Corbett, J., "An Historical Review of the use of dye precursors in the formulation of commercial oxidation hair dyes," Dyes and Pigments, Vol. 41, 1999, p. 127-136]:

- 4-amino-2-nitrophenol,
- p-phenylenediamine,
- 2,5-diaminotoluene,
- N-phenyl-p-phenylenediamine,
- 2-aminophenol,
- 3-aminophenol,
- m-phenylenediamine,
- 2,4-diaminotoluene,
- 2.4-diaminoanisole,
- 2,4-diaminodiphenylamine,
- 2-nitro-p-phenylediamine,
- 4-nitro-o-phenylenediamine.

Clairol hair products today contain many of these compounds including 2-nitro-phenylenediamine, nitroamines, nitrophenols, and blue, red, and orange colors derived from nitrophenylenediamine [National Institutes of Health, http://householdproducts.nlm.nih.gov/cgi-bin/household, 6/2006]. All of these compounds are derived from fundamental dye chemistry involving nitration of halogenated benzenes, subsequent reduction to anilines and phenylenediamines, and reaction of these chemical intermediates to form the final product [Ventakamaran, K., "The Chemistry of Synthetic Dyes," Vol. I, Academic Press , New York, 1952]. Ashland produced chlorodinitrobenzene [Olasin, p. 201]. It is likely that Ashland carried out nitration reactions in making Clairol products with attendant acidic dye wastewaters containing nitroanilines and nitrophenols.

Celleri describes one of the dyes as nitroaminophenol [Celleri, p.23], and Curley [1996, p.61] recollects that nitration was a process step in one of the hair dyes. Clairol used 4-amino-2-nitrophenol in their formulations in 1970 and 1984. It is likely that Ashland manufactured nitro-aminophenol. Dye wastewater from such a process would contain high concentrations of nitric and sulfuric acid and about 10-20 % of organic reagents, products, and by-products.

In the period of 1964-1977, Clairol was very active in applying and modifying nitrophenylenediamines for hair formulations [Brunner, W.E. et al., 1966, US 3,274,249, "Derivatives of 1,4-Diamino-2-Nitrobenzenes"; Brody, F., Pohl, S., 1975, US 3,884,627, "Oxidative Hair Dye Compositions"; Bil, M.S. 1976, US 3,959,377, "Method for Preparing 2-Nitro-4-AminoN-Phenylaniline"; Halasz, A., Cohen, D., 1977, US 4,021,486, "Hydroxyalkyl-Aminonitrodiphenylamine Compounds Useful as Hair Dyes"; Steinland, R. et al., 1978, US 4,119,399, "Composition for Coloring Hair..."; Bil, M.S., 1981, US Re. 30,798 (3,632,582 / 1972), "Process for preparing Nitro-p-Phenylenediamines". A large number of chemicals related to nitrophenylenediamines was prepared and tested. The fundamental reactions included nitration of fluoroaniline to prepare fluoronitroaniline. This key intermediate was then converted to a variety of compounds by substitution of the fluoride group. These derivatives included reaction products with ethylene oxide to yield HC red # 3 and HC blue # 2.

Curley states that the following hair dyes were produced by Ashland:

NOPD (nitro-o-phenylenediamine), NPD (presumably nitrophenylenediamine), P-101, PU 020, P-025, P-116, P-150, P-153, P-154. Also, reference is made to waste components P-109 and P-154, presumably other hair dyes that were produced, in addition to DNTA, NDAPA, and 4-nitro mother liquor. Curley [1996, p. 175] and Celleri [p. 23] state that a common reagent for the hair dyes was nitrofluoroaniline. It is highly likely that many of the hair dyes were prepared according to the reactions of different amines and aminophenols with nitrofluoroaniline as described in the various patents. Upon filtration of the dyes, the dye mother liquors would contain small amounts of dye products and about 5-20 % of reaction by-products such as dimers and nitrophenols.

The chemistry in producing Clairol hair dyes and intermediates matches the capability of the Ashland plant. Product purification commonly involved filtration or centrifugation of solid products. The filtrate was dye mother liquor, which contained toxic components such as reaction by-products, undesirable product isomers, dissolved product, spent acids, and salts. These mother liquors were disposed of off-site. Subsequent washing of the filtered material produced further wash waters containing salts and reaction by-products. In May 1977, about 30,000 gal of dye wastewater was produced [Curley 9].

Phthalide

Ashland produced phthalide, a useful intermediate for pharmaceuticals and dyes. Curley recollected zinc oxide as a reaction product because it gave them troubles in waste treatment. Phthalide can be prepared from phthalimide by reaction with zinc, a small amount of copper, and sodium hydroxide [Organic Syntheses Coll. Vol. II, p. 526, 1943]. Upon final acidification, the

phthalide is filtered. The filtrate would contain acid, acid salt, and zinc and copper ions, in addition to about 30 % organic by-products. These are likely to be phthalic acid, phthalimide, phthalide, and hydroxymethyl benzoic acid. Such a process is consistent with the description of the phthalide waste stream as containing 1.5 % sulfuric acid and 32 % sodium sulfate during this period [ASHL00002-3]. It is likely that during the 1976-1977 timeframe, phthalide was used to prepare phenoxymethylbenzoic acid [Curley, 1996, p. 147].

Ashland generated an acidic waste stream from phthalide production containing about 1.5 % sulfuric acid, 32 % sodium sulfate, about 30 % organic by-products, and zinc and copper sulfate. Water washes and recrystallization water with correspondingly lower concentrations of chemicals also were generated.

Miscellaneous Products
Ashland produced other products including CMPA (cyclomethylpropylamine), DBHMDA (dibutylhexylamine), TPS in benzene solvent (triphenylsulfonium chloride according to Celleri), anti-oxidants, and physically treated (ground) phenolic resins. Wastes such as distillation residues and filtration liquids would likely have been produced.

Diphenylacetonitrile (Dipan). Ashland produced diphenylacetonitrile with an attendant wastewater and distillation residue. The wastewater contained 14 % aluminum chloride that was hydrolyzed, 1 % hydrogen chloride, 3 % aluminum salts, and about 10 % organic material such as reaction by-products and benzene [ASHL00002-3]. Such a waste stream is reasonably consistent with an accepted synthetic method for this product [Harrison, I.T., Harrison, S., "Compendium of Organic Synthetic Methods," Wiley Interscience, NY, NY, 1971, p. 474]. Purification of this material by distillation would have led to tar residues [Curley, 1996, p.150].

Ashland generated a variety of organic solvent wastes from solvent use as reagent, solvent, or purification medium during production of various chemicals.

STEEL PROCESSING
Processing of steel involves a number of metal treatment processes depending on the type of material that is being produced [USEPA, "Profile of the Iron and Steel Industry, EPA/310-R-95-005, September 1995]. Hot and cold forming of the metal improves mechanical properties, machinability, size accuracy, or thinner gages. Metals are commonly treated to remove mill scale, rust, oil, and other foreign substances. This process may involve solvents, air, abrasion, or alkali and acid pickling. During cold forming of wires, tubes, sheets, and strips, lubricants are used. These lubricants generally are fatty acids such as ricinoleic acid or derivaatives, mineral oils, or emulsions of the two types of lubricants [Meisters, I.D., "Water Soluble Lubricants," US 3,720,695, 1972; Loftus, T.J., "Reconditioning Oil used in Cold Working metal," US 3,793,184, 11974]. Because steel can become brittle during these actions, it is generally annealed subsequently. Before annealing, the surface is generally cleaned with alkali-water rinses.

Acid steel pickling for surface cleaning generally involves hydrochloric or sulfuric acid. Some stainless steel or steel alloys are pickled with nitric and hydrofluoric acids because hydrogen chloride can have a negative effect on the metal properties. Pickling is accomplished by dipping metal parts or wire into acid baths in batch mode or by moving the metal through a pickling bath or spray. Metal parts are removed from baths and rinsed with large quantities of water and alkali.

Steel is protected further by coating it commensurate with its final use. Coating may consist of chemical plating, electrolytic plating, painting, and polishing.

Each of these steps uses chemicals that eventually yield wastes. During cold rolling, water-soluble oils are used as coolants and removed with basic water solutions. During temper rolling, mineral oils decrease friction. Metal cleaning can yield solvent wastes and sludges. Pickling yields acid and alkali wastes containing used chemical reagents and an accumulation of surface materials from the steel. Salts and oils accumulate in the rinses. Plating chemicals may contain metal ions such as zinc, tin, lead, copper, nickel, or chromium, and complexing agents such as cyanide ions.

NRM INVESTMENT COMPANY (NRM)

NRM's Malvern, PA, plant processed hot rolled steel throughout the period of 1974-1979. Other owners operated the mill before and after NRM in the same general manner from 1962 to 1989 [Wilmer, J. W. Jr., Letter to USEPA, July 14, 1993; Winters deposition]. The following operations occurred [Wilmer; Fackenthal, E. Response to Interrogatories, July 24, 2004] :

1. Pickling. Hydrochloric acid was used to remove scale and oxidation products from the steel. The treated metal was rinsed successively with aqueous sodium hydroxide and water. This process produced two waste streams, spent pickling liquor and pickling rinsate.
2. Cold rolling in Sendzimir mills (Z mills). This process used a water-soluble oil as coolant. The oil became part of a waste stream after the following cleaning process.
3. Cleaning after Z milling removed the oil with aqueous sodium hydroxide washes.
4. Annealing at about 1,200 ° F in a reducing atmosphere.
5. Temper rolling during which a light mineral oil reduced friction. A light oil rust preventative was applied. The oil became part of the following cleaning waste stream.
6. Plating. The metal was cleaned again with hot aqueous sodium hydroxide and rinsed with water. A zinc coating (galvanizing) was applied electrolytically in the presence of sodium hydroxide and sodium cyanide. Nickel plating also was carried out.
7. Painting.
8. Slitting and trimming.

The largest waste streams from these operations were pickling liquors and pickling liquor rinsates. About 10-15 % w/w of hydrochloric acid was used for pickling depending on the type of steel [Freda]. The plant also pickled steel from other steel producers. Purchased hydrochloric acid was generally diluted with two volumes of water per one of hydrochloric acid [Piotti]. This dilution results in a 14 % solution of hydrochloric acid, in agreement with Freda's recollection.

The pickling capability of this acid became unacceptable at 4- 6 % hydrochloric acid and a resulting ferrous chloride concentration of about 20-30 %. In the 1970's, pickle acid reclamation of hydrochloric acid was carried out at about 3,000 gal/day when the reclamation was operating well [Piotti]. This reclamation produced pickle liquor for disposal of about 3-4 % hydrochloric acid and about 30 % ferrous chloride [Freda]. In 1987, when waste reduction had undoubtedly reduced wastes considerably relative to the early 1970's, the pickle liquor rinsate also contained trace amounts of chromium, zinc, nickel, copper, and cyanide [Wilmer]. In the period of 1970-1977, the plant required about one load (3,800 gal) of fresh hydrochloric acid for meeting production of the pickling line [Piotti, p. 75]. Such a usage level would translate to about 11,000 gal/day of spent pickle liquor, reasonably consistent with Piotti's recollection of five 5,000-gal tank trucks of waste being moved out on busy days. Spent pickle liquor was stored in two 10,000-gal holding tanks.

The acidic pickle liquor adhering to the pickled steel was subsequently washed with sodium hydroxide solution and rinsed further with water. Before the late 1970's when a filtration system was put in place, this rinsate was collected in a concrete holding pit of approximately 15,000-gal capacity. Other rinsates from cold rolling and from the plating baths were also collected in this pit [Winters dep., Piotti dep.]. These rinsates contained neutralization salts and traces of heavy metals and cyanides. In the mid-1970's, this rinsate waste was disposed of off-site at a daily rate of at least 18,000-30,000 gal.

Concentrated wastes from the ten plating baths contained cyanide, base, and high concentrations of zinc. These liquids were disposed of separately from the pickling wastes.

Lubricants and cleaners from rolling were collected in an oil-water pit. Oil was separated, re-used or disposed of, liquids were re-used or disposed of, and sludges were disposed of.

In the early to mid 1970's, NRM produced large quantities of spent pickle liquor containing about 4 % hydrochloric acid and about 30 % ferrous chloride. NRM also produced large quantities of rinsates from pickling, cleaning, and plating which contained oil and grease, cyanides, and heavy metals such as zinc, chromium, copper, and nickel. These streams were disposed of off-site.

CARPENTER TECHNOLOGY CORPORATION

Carpenter's Reading, PA, plant produced stainless steel and high-temperature steel alloy wire, strip, and bars during the period of 1970-1980. In 1969, Carpenter produced about 50 % stainless steel that was pickled with a variety of acids. About 20 % of its production, electronic, magnetic, and electrical alloys, was pickled with sulfuric and hydrochloric acids, about 15 % of production, tool and alloy steels, was pickled with sulfuric or nitric acids, and about 15 % of its production, high-temperature alloys, was pickled with nitric and hydrofluoric acids [Mann exhibit 10]. Steel was dipped into acid baths from overhead suspensions and rinsed after pickling with water in separate baths [Adams dep]. These acid streams were sent from the pickling baths to three different acid storage tanks via dedicated piping [Elbert dep]. Tanker

trucks removed the acid wastes for off-site disposal. In 1969, about 38,000 gal/month of sulfuric acid, 108,000 gal/month of nitric acid/hydrofluoric acid, and about 135,000 gal/month of hydrochloric acid were produced [Mann 10]. Rinse waters were treated in the on-site wastewater treatment plant. Residue from this treatment resulted in on-site storage of metal sludge in lagoons at the rate of about 5,000 tons/year [Mann 10].

In 1973, about 460,000 gal/month of acid were disposed of off-site, and in 1974, about 360,000 gal/month of acid were disposed of off-site. The composition of these acids was analyzed from September, 1972 to July, 1974 [Mann 3]. **Table 1** summarizes the average composition (14 samples) of three different acid waste streams. Special waste analyses are an average of 10 samples. Weight percentages for the acids were calculated based on initial acid concentrations of 37 % for hydrochloric acid, 94 % for sulfuric acid, 68 % for nitric acid, and 70 % for hydrofluoric acid [C018468]. In early 1971, purchased concentrations of 32 % hydrochloric acid, 93 % sulfuric acid, 65 % for nitric acid, and 70 % for hydrofluoric acid are described [Mann 15].

Table 1. Average Weight Percent Composition of Carpenter Waste Pickling Acids between 1973-July 1974

Compound	Hydrochloric Acid	Nitric Acid	Sulfuric Acid	Special Acid
Hydrochloric	**17**	**0.2**	**0.5**	**9.6**
Hydrofluoric	**0.2**	**2**	**0**	**0.1**
Nitric Acid	**0.8**	**8**	**1**	**2.3**
Sulfuric Acid	**0.9**	**0.1**	**15**	**<0.1**
Iron	**3.4**	**1.5**	**1.1**	**1.4**
Nickel	**1.1**	**0.3**	**0.1**	**1.1**
Chromium	**0.5**	**0.2**	**0.2**	**0.2**

These compositions of acid waste streams for 1973-74 are in general agreement with those described by Mann in February, 1971[Mann 15]. In 1971, the acid waste streams also contained other metals in accordance with the composition of the steel that was cleaned. The hydrochloric acid stream, for example, contained about 0.05 % cobalt, 0.02 % copper, 0.03 % manganese, about 0.01 % of magnesium, < 0.01 % phosphorous, 0.003 % of titanium, and 0.02 % of vanadium in addition to iron, nickel, and chromium concentrations similar to those of Table 1. The compositions are also consistent with the description of the Carpenter waste hydrochloric acid stream in 1974 as being 14-20 % of hydrochloric acid and 7 % ferrous chloride [Adams 3].

From 1972 to 1973, Carpenter disposed of off-site large quantities of corrosive hydrochloric, sulfuric, hydrofluoric, and nitric acids containing, on average, up to 34,000 ppm of iron, 11,000 ppm of nickel, 5,000 ppm of chromium, and several other heavy metals.

TECHALLOY COMPANY, INC.

The Rahns, PA plant produced specialty steel wire and strip products in the period of 1967-1979. The manufacture of stainless steel, Inconel, Monel, and Nickel parts included the following operations:

- Cold rolling with Z mills, annealing, cleaning, and slitting
- Wire drawing, pickling, and annealing.

The pickling process used 20 % hydrochloric acid, 20 % sulfuric acid, 2 % hydrofluoric acid, and 5 or 10 % nitric acid [Energy Impact Associates, 1980, "Evaluation of TCE Contamination at Rahns, Pennsylvania,"]. Spent liquors were siphoned from the pickling tanks into a trench below the tanks [Hahn deposition]. This trench connected via a pipe to an underground pit. Material was pumped from this pit to an overhead storage tank from which it was transferred to tanker trucks for off-site disposal. At another plant processing stainless steel and alloys containing nickel and chromium [Carpenter], spent acids contained 4-6 % acids, 15-20 % ferrous chloride, and percentage amounts of nickel and chromium.

Rinsates of the pickled steel with sodium hydroxide and water were also placed into the trench. These solutions contained sodium salts of the pickling acids, iron, and small amounts of nickel and chromium.

Trichloroethylene (TCE) was used a degreaser at an average of about 1,200 gal/year between 1976 and May, 1979 [Interrogatory, 02/85] and from 1969 to 1977 [Roeder, W.V., letter to US EPA, December 18, 1992]. TCE was filtered and re-used as much as possible. TCE sludges were placed into drums and disposed of off-site. Alternatively, TCE was placed into barrels for evaporation and sludge was placed into the acid holding pit [Czerpak]. DiDomenico, who was in charge of the pickling house, stated in a 1979 interview that spent TCE was placed into the underground acid pit [Energy Impact Associates].

Laboratory wastes were placed into the trench [Stufflet dep]. All types of wastes were placed into the trench according to Czerpak [deposition, p. 31].

In 1979, groundwater contamination by TCE near the Rahns plant was traced to the leaking trench and pipe in the pickling house. The groundwater contamination had a pattern similar to contamination by acids, chloride ions, sulfate ions, nitrate ions, and fluoride ions. These data are consistent with the conclusion that TCE and acidic pickle liquors and rinsates were mixed in the trench and underground pit and leaked into the subsurface over a period of time.

Techalloy disposed of large quantities of pickle liquors containing percentage amounts of hydrochloric, sulfuric, nitric, and hydrofluoric acids. These pickle liquors contained about 20 % ferrous chloride and percentage amounts of nickel and chromium. Combined with these liquids was TCE from degreasing operations. Rinsates from pickling were also stored in the same pits and disposed of off-site.

HANDY & HARMAN TUBE COMPANY

In the 1970's, Handy & Harman Tube Company (Handy) manufactured small diameter, precision tubes at Norristown, PA. Materials were primarily SS 300, containing about 8-12 % nickel and 18-20 % chromium, and nickel-based alloys containing up to 70 % nickel [Curran deposition]. The process included the following steps:

1. Acid cleaning (pickling) in nitric acid, about 20 %, in nitric acid/hydrofluoric acid mixtures (10 % nitric acid/3-4 % hydrofluoric acid), sulfuric acid, and hydrochloric acid. Pickling occurred in four cleaning baths of about 40 ft x 3 ft x 3 ft and included rinsing of the materials. Rinsates and spent acids were pumped to two storage tanks in the basement. This procedure is typical of acid cleaning operations in the steel processing industry and is expected to generate wastes containing acids at percentage concentrations and nickel and chromium heavy metals in the thousands of ppm concentration. Rinsates contain the same constituents at lower concentrations. These wastes were disposed of off-site [Curran, Kollmar depositions].
2. Cold drawing the lubricated tubes through dies to reduce the diameter of the tube. Lubricants were hydrocarbon-based oils [Curran].
3. Degreasing with trichloroethylene (TCE) to remove lubricants in a degreasing bath of approximately 10 ft x 15 ft x 3 ft. This procedure generated two types of wastes for off-site disposal in drums. When the TCE became saturated with lubricant, it was distilled. Distillation residue consisted of about 50 % TCE, 50 % lubricant, and metal particles and other solids [Flax, M.E., September 16, 2004, Response to Interrogatories]. Second, over time, solid particles, dirt, TCE, and lubricant accumulated in the bottom of the degreasing bath. These sludges were cleaned out periodically. These TCE-containing wastes were disposed of as industrial waste in drums. In the 1970's, TCE was replenished at 2,000 lbs per approximate 6-8 week period [Kollmar].
4. Annealing to soften the metal for further size reduction.

The above processes were repeated depending on the customers' specifications.

Small amounts of waste were generated from methyl ethyl ketone or acetone that were used for tool cleaning. These occasionally entered the general plant streams but were generally disposed in 30-gal drums. TCE was also disposed of in a cistern, and lubricating and waste oils were used for dust control on a former parking lot [RMC Environmental Services, Inc., September 1992, Site Investigation, Handy & Harman Tube Co., Norristown, PA]. These types of disposal practices were common in the 1970's. The basement in which the acid storage tank was located also housed the maintenance and plumbing departments. It is likely that degreasing solvents, including TCE, were placed into the waste tank occasionally.

During the 1970's, Handy & Harmon generated acid wastes containing hydrochloric, sulfuric, nitric, and hydrofluoric acids from their pickling operations and subsequent rinsates. The aqueous wastes contained nickel and chromium heavy metals and were disposed of off-site. Handy also generated TCE-containing wastes from distillation residue and from cleanout of sludge residues in the degreasing bath. These wastes were disposed of off-site in drums. It is

likely that the spent acids also contained TCE from disposal of TCE wastes in the spent acid storage tanks.

PRINTED CIRCUIT BOARD MANUFACTURE

The manufacture of physical structures such as printed circuit boards on which electronic components can be mounted includes a number of general operations [USEPA, 1995, "Profile of the Electronics Industry," USEPA/310-R-95-002]:

1. **Board Preparation.** Generally, photographic methods transfer the circuit pattern to copper boards mounted on epoxy resin or fiberglass. Holes are drilled to provide electrical paths between the layers and to mount components. The boards are then cleaned to remove particles from these operations.
2. **Electroless Plating.** First, holes are prepared to remove smeared resin. Electroless plating then coats a uniform layer of copper on the holes and the surface of the board to allow further electrolytic deposition. The boards are dried.
3. **Imaging.** Photoresists are applied to the board in areas in which the circuit pattern will not be set. The board is exposed to a radiation source and developed to remove unwanted areas of the resist. Light etching, usually with ammoniacal etchants, removes rust inhibitors and other metals. If stenciling is used, the protective layer is dried and exposed copper is etched away. Photoresist is removed with a stripper.
4. **Electroplating.** Copper is deposited electrolytically to build up the thickness to provide reliable conductivity between layers. This involves immersing the article into a bath containing various chemicals. A plating resist is applied. Generally, tin/lead solder is plated on the board to protect the circuit pattern. Ammoniacal and cupric chloride are primary etchants used to remove exposed copper foil. The board is rinsed and dried. The tin/lead layer is removed and the board is tested electrically.
5. **Soldering Coating.** Solder coating by immersion of the panel adds solder to copper components. The alloy, 60 % tin and 40 % lead, coats the pads and holes not covered by the solder mask. Excess solder is removed.
6. **Electrical and Mechanical Testing.**
7. **Assembly and Soldering.** Electrical components are attached to the board by soldering. The board is cleaned and dried.

All these processes generate waste streams from spent solutions, rinses and drag out, spills, and cleanup of machines and bath residues. A variety of chemicals are used depending on specific company and client.

FLEXIBLE CIRCUITS, INC. (FCI)

FCI manufactured printed circuit boards consisting of flexible circuitry and power busbars at the Valley plant beginning in 1968. In the 1970's, it carried out copper, nickel, and gold plating, etching, wave soldering, and the accompanying rinses. In the early 1970's, as much waste as possible, mostly rinsates, went to the sewer. Concentrated plating and etching solutions were

stored in underground tanks and disposed of off-site. In 1983, the process was described as follows [BSAI082785-BSAI082800]:

1. The raw material was purchased as a rolled copper, Kapton, and acrylic adhesive laminate.
2. The laminate was drilled.
3. The laminate was plated :
   a. Degrease, rinse, and condition
   b. Rinse twice
   c. Micro etch with sulfuric acid/hydrogen peroxide (copper sulfate) and rinse
   d. Catalyze with a tin and palladium colloid solution, rinse twice
   e. Accelerate by removing tin
   f. Electroless copper plating using formaldehyde, sodium hydroxide, and copper sulfate; rinse
   g. 2 % sulfuric acid dip to remove oxides
   h. Electrolytic copper plate
      1. Plate with copper sulfate to build up copper thickness, rinse
      2. Coat with light sensitive material, Riston
      3. Expose to white light to print image onto laminate
      4. Develop image in bio-degradable solution, rinse
      5. All copper exposed on the laminate is etched with cupric chloride (hydrochloric acid, hydrogen peroxide, water, copper); rinse
      6. Strip off Riston with an alkaline solution of butyl cellusolve; rinse
      7. Scrub laminate.
      8. All copper surfaces except interconnects are protected with a cover layer of Kapton and adhesive
      9. Interconnects are soldered by fluxing the laminate with rosin, dipping in a pot of molten solder, and removing excess solder with Freon

In 1968, effluent containing 40 ppm of copper was discharged to the local sewage treatment plant [BSAI082380]. In 1970, discharge water to ground contained 325 mg/l of copper [BSAI082558]. In response, the company disconnected tanks of 1,500 gal capacity used for cooling water and rinses and a 3,000 gal tank used for concentrated waste and waste acid [BSAI082571, 77]. In 1971, holding tank overflow was pH 3.4 (HCl) and 325 mg/L of copper (copper sulfate).

In 1972, a waste hauler removed contents of two buried underground tanks, one tanker truck, and one steel holding tank approximately every two weeks [BSAI082620]. On two occasions, the contents of the tanker truck contained pH 5.8 water with 160 mg/l of copper [BSAI082620} and pH 3.2 water containing130 mg/L of copper and hundreds of µg/L of chromium, nickel, and zinc [BSAI082630-32]. In 1973, 11 drums (55 gal) and seven drums (30 gal) were disposed of. This constituted about two days of rinses if the plant could not discharge to the municipal treatment plant [Bach deposition, p. 55]. In 1979, discharge under the plant fence contained 145 mg/L of copper and 66 mg/L of chromium [BSAI082434]. In 1974, waste quantities of 4,000-6,000 gal were hauled off in trucks [BSAI00088-00092]. Concentrated and dilute aqueous streams consistent with operational processes were being disposed of during the 1970's.

Until 1979, about 55 gal/month of trichloroethylene (TCE) was used to clean machinery [BSAI082453]. Disposal to the ground, waste storage, or to recycler was a likely disposal method for this waste based on the common waste handling methods of the period.

In the 1970's, FCI disposed of large quantities of spent plating and etching baths and their rinsates off-site. Among many chemicals in these wastes were hydrochloric and sulfuric acids, copper, tin, lead, chromium, and nickel. TCE may also have been discharged in these aqueous wastes occasionally.

ETCHED CIRCUITS, INCORPORATED

In the 1970's, Etched Circuits manufactured printed circuit boards at the Cherry Hill, NJ location. Until about 1985, single and double-sided printed circuit panels were manufactured. The process during the time frame of about 1970 –1990 essentially remained the same, however [BSAI082830-082857]. The process, as described in 1990, consists of the following steps:

1. Pattern is placed on copper clad fiberglass panels with photoimagable dry film.
2. Pattern is etched into copper foil
3. Film is removed and copper pattern is oxidized.
4. Panel is dried and laminated with a layer of copper foil on each side.
5. Holes are drilled and desmeared.
6. Pattern is placed on outer foils with photoimagable dry films.
7. Panel is plated with electroless copper.
8. Film is removed and board is electroplated with copper and tin/lead composition.
9. Pattern is etched into outer copper foils.
10. Epoxy paint (solder mask) is added.
11. Tin/lead plating is fused with an infra-red oven.

Optional steps included solder stripping and plating nickel/gold to board.

The electroless copper line consisted of 22 baths of generally 130 gal tanks. The process included 10 rinses and used, among others, the following chemicals: sulfuric acid and copper complexes. The desmear line consisted of about 15 tanks of about 50 gal capacity and used, among others, sulfuric acid and potassium permanganate. The acid copper plating bath, 1425 gal, contained copper sulfate, sulfuric and hydrochloric acids, and proprietary electrochemicals. Etching used copper sulfate/ammonia and acid solutions. Waste resulted from rinsates and drag out, spent concentrated baths, spills, and periodic cleanups. Heavy metals that were used are copper, tin, lead, chromium, and nickel.

The building in which these operations occurred had a drainage trough for spill collection. As part of facility closure in 1990, chip samples were taken from the floor and walls of the building. These samples contained cyanide (maximum of 145 mg/kg), 10-117 mg/kg of chromium, 24-53,000 mg/kg of copper, 7-9,200 mg/kg of lead, 8-8,700 mg/kg of nickel, 30-

970 mg/kg of zinc [BSAI082901-082951]. These analyses are consistent with the types of operations and chemicals used by Etched Circuits.

In the 1970's, Etched Circuits disposed of spent plating and etching baths and their rinsates off-site. Among many chemicals in these wastes were hydrochloric and sulfuric acids, cyanide, copper, tin, lead, chromium, and nickel.

MERIT METAL PRODUCTS CORPORATION

Merit Metals manufactured non-ferrous metals at its facility at 242 Valley Road, Warrington Township, PA in the 1970's. Metal was cast in a foundry and machined by drilling, milling, grinding, and polishing [Wolberg deposition]. After polishing, degreasing with trichloroethylene (TCE) was performed from 1968 to 1979 [NUS Corporation, 1990, "Site Inspection Using Available Information of Merit Metals Product Corporation", R-585-6-9-68]. A portion of the products was plated with nickel and chromium in plating baths of about 2 ft .x 4 ft.

The degreasing operation would generate TCE-containing sludge and dirty TCE. The plating operation would generate spent plating solutions containing nickel, chromium, cyanide, and other chemicals. In addition, plating would generate rinsate waste containing plating chemicals. Spills and cleanout operations would also generate waste products.

In 1971, two 55-gal drums of plating rinsates were dumped illegally by Merit [Wills, A.C., February 1, 1971, Letter re Industrial Wastes, Bucks County Department of Health]. The solutions contained cyanide, chromium, nickel, and copper ions, consistent with plating operations. In 1972, wastes from the facility were stored in two 1,000-gal underground tanks and a 4,000-gal tanker truck [Hogg, E.C., February 17, 1972] Waste Inspection Report, Department of Health, PA]. Waste was hauled off-site as needed. These tanks existed from 1971-1979 [NUS, 1990].

In 1979, TCE contamination in wells near the Merit site led to a far-ranging investigation. TCE was found in the two underground tanks at 42 and 72 ppm and at 1-3 ppm in the sludge from the bottom of the tanker truck [NUS; County of Bucks, Department of Health, October 10, 1979, Letter to M.N. Silverman]. Soil below the tanks also contained TCE [NUS]. The underground TCE contamination in the wells was attributed to leakage from the tanks [NUS; International Exploration, May 1980, Hydrogeological Investigation, Merit Metals Products Co.].

In the 1970's, Merit Metals generated wastewater containing cyanide, chromium, nickel, and copper among others. The wastewater was stored in underground tanks and a tanker truck. The wastewater contained TCE from co-disposal of degreasing sludges, spent degreaser, and TCE from spills. These wastes were hauled off-site when disposal to the municipal treatment system was curtailed by plant violations.

SIGNATURE
As discovery in the litigation continues, I reserve the right to modify and/or supplement this opinion based on new information that becomes available. I am being paid $ 175/hour and $ 350/hour for testimony.

Jurgen H. Exner, Ph.D.

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Hendershot, H., 2/1/2005, Deposition
Olasin, W., 5/14/2001, Deposition
Wilcox, C., 2/2/2005, Deposition
Celleri, A., 2/2/2005, Deposition
Curley, A., 8/21/1996, 12/9/2004, Depositions
ASHL00002- ASHL00003
ASHL00004- ASHL00252
ASHL00056- ASHL00124
BSAI006479- BSAI006481
BSAI006529- BSAI006530
BSAI006573- BSAI006574
BSAI033355- BSAI033358
BSAI001067
BSAI033937- BSAI033938
BSAI024255- BSAI024256
BSAI033916
BSAI024275- BSAI024276
BSAI033932
BSAI034201
AETC180-AETC183

4. During testimony, I expect to use process flow diagrams to illustrate sources of wastes. Also, I expect to use drawings of chemical structures.

5. PROFESSIONAL QUALIFICATIONS

JURGEN H. EXNER

PROFESSIONAL QUALIFICATIONS

Dr. Exner has 31 years of experience in hazardous waste management and seven years in the chemical industry. He has experience in assessing environmental information and developing effective solutions based on regulatory, economic, technical, social, and legal considerations. He has expertise in site investigation, sampling and analysis, and feasibility studies, in remediation, and in the application of thermal, chemical, physical, and biological treatment methods to solve environmental problems. He has evaluated and commercialized technology by combining market and regulatory knowledge with process development skills. He has carried out laboratory treatability, pilot plant and field

demonstrations through startup of operations. Dr. Exner has built and managed technical groups and developed management strategy for entering new market areas. He provides peer review for government and technical publications.

BACKGROUND

12/1992 to present

President and Principal, JHE Technology Systems, Inc., Alamo, CA
Environmental consulting in litigation support and expert witness involved: evaluation of chemical processes for pollution by-products, examination of site contamination, fingerprinting, and validity of remediation selection, consent agreements, selection of remediation contractors, cost of remediation, proposal evaluation, technology startup operations and operational problems, cost overruns, the state of knowledge of groundwater contamination.

Management strategy for environmental protection and restoration, technology evaluation, and commercialization of new technology. Management strategy and alternative technology evaluation for soil and groundwater restoration for a $60-300 million remediation company over the last 12 years. Summary of treatment methods for persistent organic pollutants in Asia. Expert review of remediation options at Bhopal, India. Reviewed soil and groundwater contamination at four Superfund sites and recommended treatment and containment systems for vadose and unsaturated zones, LNAPL and DNAPL. Evaluated fate of 200 pollutants in industrial surface impoundments. Developed and managed design and construction of a treatment process for uranium and radium-contaminated wastewater at a Superfund site. Prepared RCRA corrective measures study for a $12 million site. Evaluated treatment alternatives for PCB-contaminated soil at remote locations. Regulatory assistance on two Superfund sites. Liability evaluation for international oil company.

9/1991-12/1992

Senior Vice President, Technical Development and OHM Analytical Services Corp., OHM Corporation, Walnut Creek, CA
In addition to OHM activities described below: Troubleshoot technical projects nationally, interface with clients in diverse industries as chief technical officer, develop strategy in response to government regulations, build technical capability. Managed $6 million company analytical services group in Findlay, OH.

8/1988 to 9/1991

Senior Vice President, Technical Development, OHM Corporation, Walnut Creek, CA
Built and managed a central technical group that consulted with clients and OHM operations on technical issues related to remedial design and restoration of contaminated sites. Managed group of 15-40 at three locations. Developed new

business in thermal treatment, bioremediation, solidification, and *in situ* vapor extraction by defining technical needs, markets, permit strategies, and marketing approaches. Engaged in joint venture development, acquisitions, and developed several technology demonstrations with major clients. Directed major technical projects in biological, thermal, chemical, physical, and solidification projects on PCB, PCP, creosote, chlorinated and hydrocarbon solvents in soil and groundwater.

2/1986 to 8/1988

Vice President, Technology, International Technology Corporation, Martinez, CA

Directed technical personnel at three locations. Acquired groundwater bioremediation group for *in situ* solvent treatment and established bioremediation capability. Directed technology assessment and development, commercialized new technology. Directed dioxin assessment, site investigation, and remediation activities in U. S. and Europe.

1983 to 1986

Technical Director, IT Corporation, Martinez, CA

Established company strategy in dioxin and PCB cleanup. Directed sampling, analytical, industrial hygiene, engineering, R&D, and immediate removal activities for cleanup of dioxin, chlorinated solvents, and PCB-contaminated soil, groundwater, and buildings for industrial clients and EPA:

Work plan for remedial investigation, feasibility study, and decontamination of chlorinated solvents, pesticides, and dioxin in chemical plants in New Jersey and Hamburg, Germany. Extensive sampling and analysis in every conceivable matrix were followed by risk assessment, alternatives evaluation, regulatory and public discussion, and engineering design. Evaluation engineering in investigations and remediation of numerous dioxin-contaminated sites in Missouri.

1980 to 1983

Engineering Manager, IT Enviroscience, Knoxville, TN

Managed 12 engineers and scientists engaged in waste management activities. Program director of $1.4 million EPA project to develop data on the fate of chemicals in biological treatment plants and for demonstration of anaerobic processes. The laboratory's chemical and engineering support activities included chemical treatment, such as oxidation and stabilization, and physical separations such as adsorption, distillation, and membrane techniques.

1975 to 1980

Senior Environmental Specialist, Hydroscience, Inc., a subsidiary of Dow Chemical, Knoxville, TN
Conceived, developed, and managed design and startup of a chemical process for the destruction of tetrachlorodibenzo-p-dioxin. A plant was constructed and startup completed within 20 months of the initial laboratory work. The project included chemical research, sophisticated analytical methods development and application, safety and industrial hygiene, engineering scaleup, interaction with regulatory agencies, and startup troubleshooting.

Source Control and Waste Minimization - Developed a pollution abatement program for a plant site contaminated by EDC and polybrominated biphenyls. Work involved housekeeping and spill prevention, stormwater runoff, process waste characterization, and development of a carbon adsorption pretreatment process. At another specialty chemicals manufacturer, a survey of wastes and disposal options decreased waste load and costs by one third. Surveyed non-incinerable wastes of two major pharmaceutical manufacturers and devised organic chemical and heavy metal recovery processes.

1968 to 1975

Research Specialist/Project Leader, Halogens Research Lab, The Dow Chemical Company, Midland, MI
Developed dibromonitrilopropionamide biocide for cooling towers and paper mills. Registered the product with EPA and FDA, provided environmental fate and detoxification chemistry, market assessment, field trials, developmental sales, and customer contacts.

Worked out the fundamental chemistry of the process for multi-million pound per year flame retardant chemical. Followed this process through pilot plant to new plant design, worked out optimum operating conditions and initiated analytical and instrumental methods development.

Process improvements and plant operation for decabromodiphenyl oxide plant doubled plant capacity. Plant design data eliminated several waste streams and recovered valuable constituents.

Directed effort toward new uses for halogen compounds and co-invented oil well completion fluid that reached 100 million lb/year.

Carried out fundamental research in the chemistry of highly acidic media, reaction kinetics, solvent effects on organic reactions, carbonium ion chemistry, synthesis of halogenated flame retardants, effects of solvation and ion pairing on chemical equilibria, and computer analysis of chemical models.

ACADEMIC BACKGROUND

Ph. D., Organic Chemistry, University of Washington, 1968
B. S., Chemistry, University of Minnesota, 1963
NSF Graduate Fellowship 1964-1967, Phi Beta Kappa, Tau Beta Pi, Phi Lambda Upsilon, Honeywell Award
American Chemical Society, Distinguished Service Award, Division of Environmental Chemistry 1999.

PUBLICATIONS

Dr. Exner has published about 40 technical papers, holds eight patents, has edited three books on hazardous waste, and given numerous presentations. Participated in workshops by the National Academy of Science and the National Science Foundation, lectured for U.S. EPA and ACS, member of U.S. Air Force Ad Hoc Committee on Hazardous Waste (1984), member National Research Council Mixed Waste Committee 1995-1999. He was on the Editorial Board of the Journal of Hazardous Waste and Associate Editor of the Journal of the Air & Waste Management Association, and is Past-Chairman of the Division of Environmental Chemistry of the American Chemical Society, 1996-1997, and Councilor, 1998-present. He was chair of the ACS Board Committee on Environmental Improvement from 2003-2005, leading environmental issues for the world's largest scientific organization.

P. Dejonghe, A. Clarke, J. Exner, K. Hansen, J. Lighty, R. Samelson, M. Steindler, B. Thomson, "The State of Development of Waste Forms for DOE Mixed Wastes," National Academy Press, Washington, DC, 1999.
P. Flathman, D. Jerger, J. Exner, Eds., "Bioremediation: Field Experience," Lewis Publishers, 1994.
J. Exner, "Solving Hazardous Waste Problems: Dioxins," American Chemical Society, 1987.
J. Exner, "Detoxication of Hazardous Waste," Ann Arbor Science, 1982.

LEGAL PROJECTS/EXPERT OPINION

Pitney, Hardin, Kipp, & Szuch - Cost Allocation at Organic Chemical Plant
Reviewed documents covering the production activities at a dye and specialty organic chemical manufacturing plant that had operated from 1926-1995 under three managements. Estimated the amounts of 50-80 products that were manufactured intermittently and the quantity of waste discharged to the environment. Estimated the quantity of those chemicals discharged that were of concern during remediation. The information was combined with an assessment of RCRA and NCP compliance and the reasonableness of remediation costs.

Hunton and Williams, Richmond, VA - The case involved cost allocation for a $135 million remediation of a wood treatment site. We examined historical documents dating to 1870, examined changes in wood treatment operations over the last century, and estimated the quantity of wood treated with creosote during operation of a wood preservation facility between 1882-

1884 based on historical records and on operability of the plant. We compared operating conditions to those used in subsequent operation from 1903-1978. We determined the probable composition of the creosote used during this time based on the state of the art of creosote production in England during the late 1800's and the probable amount of waste produced based on cost information from the period and on typical wood treatment operations. We evaluated the pathways by which the waste entered the environment (soil, groundwater, surface stream), and estimated the fate of the waste constituents in the various environmental compartments over a period of 18 years of plant inactivity. These data were related to the total waste generated throughout the plant operating time and to the proportion of remedial costs. Deposition.

Hunton & Williams, Washington, DC - North Hollywood Dump Litigation- The case involved cost allocation for landfill remediation. We reviewed the manufacturing processes for a pesticide production plant and determined the composition and quantity of probable waste streams produced in 1955-1964. We demonstrated that a prime contaminant in the landfill was produced as a 20 % by-product of the main product, heptachlor. We related sediment composition in surface water bodies near a landfill to waste transport from the landfill rather than from residential runoff. We examined background data for pollutants in the environment and in fish to identify the source pollution from the landfill. We refuted plaintiff's contentions on landfill composition based on statistical sampling methodology and hot-spot characterization. Deposition. The case was settled to our client's satisfaction.

Heller Ehrman, White, and McAuliffe, Palo Alto, CA - Fingerprinting of contaminated site to examine potential contributors to contamination. Evaluated client's and possible responsible parties process and reaction by-products, examined their presumed environmental fate (leaching, volatilization, biodegradation, chemical and uv reaction), and carried out detailed examination of mass spectral data. Examined potential remediation methods involving new technologies and prepared a critical comparison with comparative cost estimates. Participated in regulatory negotiations and reviewed proposed remediation process.

W. Koenig, Esq., Walnut Creek, CA, Collins v. Baxter- Reviewed preliminary, incomplete site investigation data from a commercial site. Estimated potential remediation costs based on an NCP-mandated cleanup. The presence of PAH components in the subsurface was traced to a closed wood treating plant. Review of historical records defined the quantity of wood produced at the site and, consequently, the amount of creosote used over a period of about 42 years. Estimated the types of wastes and quantities that may have been produced during this operation, and estimated the extent of the potential contamination. Deposition.

Hunton and Williams, Atlanta- Provided expert opinion to a PRP group on a $ 5 million cost overrun by the remediation contractor at pesticide-contaminated sites. Examined the site investigation, feasibility study, RFP, and contract documents and reviewed the remedial operation.

Shearman and Sterling, New York, NY - A breach of contract suit on a $60-million acquisition involved the question of potential environmental liability at a site. I evaluated from the standpoint of a prudent site operator: (1) The validity of a TCE groundwater analysis at the

method detection level, (2) The relationship of this analysis to the MCL and, therefore, the perceived risk, and (3) The probability of the site being the source of the contaminant. Prepared expert report.

Heller Ehrman/Lester Schwab, Seattle, WA and New York, NY - Hartford v. Wausau. Cost recovery litigation about the remediation of dioxin-contaminated sites in Missouri, about $ 115 million. I examined information to address the reasonableness of the following issues and gave a deposition on:
(1) The selection of the remediation solution by US EPA. This part involved an examination of the site investigation/feasibility study, an assessment of the health concerns by inhabitants, and description of political pressures in Missouri during the remediation selection procedure,
(2) The procedure and rationalization that was used to estimate potential remediation costs prior to negotiation of a consent decree with the Justice Department,
(3) The procedure used to select a contractor for remediation and the anticipated costs of part of the remediation, $ 42 million,
(4) The costs incurred by the government during early-phase remediation activities and in general, the difference in governmental remediation costs versus remediation by private industry,
(5) Special factors in remediation of dioxin-contaminated sites which add to cost, public and regulatory scrutiny and review, and special precautions for protection of health and the environment.
Deposition. The client won cost recovery.

U.S. DOJ Commercial Litigation, Washington, DC - Thermocor v. US. A dispute over a large cost overrun on a PCB Superfund site. I reviewed the site data, the request for proposal, the bidding procedure, the demonstration field test of the untried technology, and the records of operation. I defined the stage of development of the technology at the time of bidding, documented assumptions made in the design of the project, and examined reasons for reduced processing rates, problems with materials handling, and equipment breakdown. I compared operating efficiencies and production problems with those experienced by three other contractors during the first application of new remediation technology. I examined a claim for patent license fees, selected an expert on metallurgy to assist on equipment issues, and recruited a geotechnical expert to address soil characteristics, another major claim issue. Gave deposition. All claims in my area of work have been denied. The case settled in February, 1997.

Crosby, Heafey, Roach, and May, Oakland, CA - The case involved an insurance claim for remediation costs of groundwater contamination by chlorinated solvents at several sites. Examined the popular and technical literature between 1959-1977 to assess the environmental awareness of the public and the technical knowledge of groundwater issues during that time period and gave deposition.

Crosby, Heafey, Roach, and May, Oakland, CA - I provided technical advice on the fate of polymethylmethylmethacrylate in wood, identified a polymer expert, and was deposed. The case was settled in 1998.

Pettit and Martin, San Francisco, CA - MRCP Realty Company v. Esselte Pentaflex. The case involved soil and groundwater contamination at a commercial site. I evaluated geological and hydrogeological data, analyses on methyl isobutyl ketone, and examined whether site contamination occurred during a particular time period.

PARTIAL LIST OF PUBLICATIONS – 1995-PRESENT

Birke, V., Burmeier, H., Poggendorf, C., Schenker, F., Exner, J.H., "Site Assessment and Accelerated Feasibility Study for Clean-Up of the Former Union Carbide Pesticide Plant at Bhopal, India," Fifth International Conference on Remediation of Chlorinated and Recalcitrant Compounds," May 22-25, 2006, Monterey, CA

Exner, J.H., "Science and Policy: Who Speaks for Science," C&EN, December 12, 2005, p. 30

Exner, J. H., "Toward a Global Environmental Ethic," C&EN, April 18, 2005, p. 49

Exner, J. H., "Global Climate Change and Citizen Chemists," C&EN, March 29, 2004, p. 45

Mahaffey,W.R., Mickel, C.E., Exner, J.H., Bowman, R., "Advanced chemical oxidation & fixed film bioreactor treatment train for remediation of MTBE impacted groundwater," Battelle 6th International *In Situ* and On-Site Bioremediation Conference, San Diego, CA, June 4-7, 2001

Exner, J. H., "Scientific Uncertainty and Risk Management," American Chemical Society 220th National Meeting, Washington, DC, August 2000, Division of Environmental Chemistry Symposium.

Dejonghe, P., Clarke, A., Exner, J., Hansen, K., Lighty, J., Samelsen, R., Steindler, M., Thomson, B., "Waste Forms for DOE Mixed Waste," National Academy Press, Washington, DC, 1998.

Exner, J., "Alternatives to Incineration in Remediation of Soil and Sediments Assessed," Remediation, Summer 1995, pp. 1-18.